An Examination of the Emotional and Cognitive Mechanisms Underlying Greed: A Neurocognitive Perspective

by

Joel Benjamin Carnevale

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn University
August 5, 2017

Key words: greed, fMRI, greedy behavior, ethics

Approved by

Alan G. Walker, Chair, Associate Professor of Management
Jennifer L. Robinson, Associate Professor of Psychology
H. Jack Walker, Associate Professor of Management
Lei Huang, Assistant Professor of Management
Garry L. Adams, Associate Professor of Management

Abstract

Despite the widespread attribution of greed as a fundamental cause of organizational misbehavior, scholarly research examining when and why overly greedy individuals put themselves before others remains scant. Drawing from a dual-process perspective, I use brain-imaging technology to examine potential neurological differences in greed. Specifically, I examine potential neurological differences (i.e., greater activity in the amygdala and ventral striatum) for those high (versus low) on dispositional greed, and whether such differences influence greedy decision-making. In addition, I explore whether activation of brain areas responsible for empathy and perspective taking of others (i.e., dorsomedial prefrontal cortex) can override prior decisions. Data was collected over two waves. In the first wave, I collected personality and demographic survey data from 809 students at a large southeastern University. In the second wave, I collected brain imaging data from 19 males (screened from the first wave) using functional magnetic resonance imaging. Results from a whole-brain voxel-wise analysis did not provide support for differences in amygdala and ventral striatum activation in those high (versus low) on dispositional greed. Further, results from a region of interest analysis did not provide support for the hypothesized mediating effect of amygdala and ventral striatum activation for the relationship between dispositional greed and behavioral greed. Finally, results of the exploratory study found no significant associations between dorsomedial prefrontal cortex activation and the overriding of prior greedy decisions. Contributions to research on greed and ethical decision-making are discussed, and limitations and future directions are offered.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ANCOVA	Analysis of Covariance
AUMRIRC	Auburn University Magnetic Resonance Imaging Research Center
BET	Brain Extraction Tool
BOLD	Blood Oxygen Level Dependent`
CEO	Chief Executive Officer
CI	Confidence Interval
COPE	Contrast of Parameter Estimates
DGS	Dispositional Greed Scale
dMPFC	Dorsomedial Prefrontal Cortex
EPI	Echo Planar Imaging
GLM	General Linear Model
FLAME	FMRIB's Local Analysis of Mixed Effects
FLIRT	FMRIB's Linear Image Registration Tool
fMRI	Functional Magnetic Resonance Imaging
FMRIB	Functional Magnetic Resonance Imaging of the Brain
FSL	FMRIB Software Library
FWHM	Full Width between Half Maximum
MCFLIRT	Motion Correction using FMRIB's Linear Image Registration Tool

MNI	Montreal Neurological Institute
MPRAGE	Magnetization-Prepared Rapid Acquisition Gradient
MRI	Magnetic Resonance Imaging
NA	Nucleus Accumbens
ROI	Region of Interest
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
TE	Echo Time
TR	Repetition Time

An Examination of the Emotional and Cognitive Mechanisms Underlying Greed: A Neurocognitive Perspective

Chapter 1

Introduction

Statement of Problem

Greed plays an integral role in unethical and immoral behavior within organizations. From tales of executives extracting organizational resources at the expense of shareholders (Armenakis & Lang, 2014; Haynes, Campbell, & Hitt, 2014) to the growing problem of employee theft and workplace deviance (Case, 2000; Coffin, 2003), it seems unbridled greed has become a systemic problem within organizations today. Recent increases in unethical business practices (Matthews, 2012), suggests that greed constitutes an increasingly important concept to organizational leaders (Haynes et al., 2014). Indeed, the greater concentration of resources within organizations (e.g., money, power, influence), coupled with the increased opportunity to interact with those resources, makes the topic quite salient to management practitioners and the stakeholders they represent.

Greed also has implications for management scholars. For instance, decisions involving the advancement of one's own interests at the expense of others are central to a wide range of organizational research including unethical behavior, prosocial behavior, organizational deviance, and corporate fraud (Aquino, Lewis, & Bradfield, 1999; DeCelles, DeRue, Margolis, & Ceranic, 2012; Grant & Mayer, 2009; Haynes, Josefy, & Hitt, 2015; Kish-Gephart, Harrison, Treviño, 2010; Reynolds & Ceranic, 2007). Recent research, for instance, has found greed to be associated (negatively) with a number of organizationally relevant outcomes such as individual well-being (Krekels & Pandelaere, 2015; Seuntjens, Zeelenberg, van de Ven, & Breugelmans, 2015), group-level cooperation (Insko, Schopler, Hoyle, Dardis, & Graetz, 1990; Wang, Malhotra, & Murnighan, 2011), and organizational performance (Haynes et al., 2014). Despite the obvious potential for greed to inform both macro and micro research, the topic of greed has garnered only modest attention from organizational scholars.

One reason for this sparse attention is because previous research has confounded the *underlying tendencies* (i.e., motivations, desires) toward greed with the *actions* that result from such proclivities (i.e., actual behaviors; Carnevale, Walker, & Walker, 2016). Indeed, extant research suggests that intentions and motivations to behave greedy may not always manifest into actual behavior (Haynes et al., 2014; Seuntjens et al., 2015). Carnevale et al. (2016) proposed a multifaceted view of greed, differentiating dispositional greed, defined as the "dissatisfaction of not having enough, combined with the desire to acquire more" (i.e., intention and motivation; Seuntjens et al., 2015: 12), from actual behavioral greed, which refers to specific, observable actions that benefit the self, and comes at a cost to – or otherwise deprives – others (Wang & Murnighan, 2011). Such a multifaceted view is important as it "provides a more complete explanation of what initiates and perpetrates the evolution of greedy behaviors" (Carnevale et al., 2016: 6). Despite this distinction, a number of questions remain regarding why and how such underlying motivations influence greedy behavior.

In an effort to address these limitations and further our understanding of greed, I draw on dual-process theory (Chaiken & Trope, 1999; Reynolds, 2006) to examine greed from a neurocognitive perspective, with specific attention to the cognitive and emotional mechanisms underlying the relationship between dispositional and behavioral greed. According to dual-process theory, many of our decisions and moral judgments are a result of independent, competing processes (Reynolds, 2006). Wang and Murnighan (2011) draw on dual-process theory to develop a theoretical model of greedy behavior. They suggest that decisions involving the potential to gain at others' expense are a function of competing psychological processes involving both cognitive and emotional reasoning. More specifically, they theorize that decisions to behave greedy are driven by automatic processes which are rapid, intense, and emotional in nature – whereas prosocial decisions are driven by controlled processes which are slow, deliberate, and cognitive in nature (Metcalfe & Mischel, 1999; Wang & Murnighan, 2011). Consistent with organizational neuroscience research, I will heretofore refer to these processes as the X-System and C-System, respectively (Reynolds, 2006).

While prior research has provided important insights into the development of greed, much of this research remains largely theoretical, providing little empirical insight into how such processes inhibit, or promote greed. This is largely due to methodological challenges inherent in capturing the nonconscious psychological processes underlying moral decision-making (Kish-Gephart et al., 2010). Many argue that recent developments in neuroscience research can provide insight into these processes (e.g., Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Tabibnia, Satpute, & Lieberman, 2008), which in turn could add significant value to organizational research (Carnevale et al., 2016; Wang & Murnighan, 2011). Thus, one important objective of this study is to explore greed through a dual-process perspective by examining the influence of such cognitive and emotional factors in promoting (or dissuading) greedy behavior.

In addition, I explore the potential for dispositional greed to influence these emotional and cognitive mechanisms. Research has shown that individuals are neither equal in their propensity to experience emotional arousal (Larsen, Diener, & Emmons, 1986; Larsen & Ketelaar, 1991; Seo & Barrett, 2007) nor in their motivation to pursue their own interests (Krekels & Pandelaere, 2015; De Dreu & Nauta, 2009; Meglino & Korsgaard, 2004; Seuntjens et al., 2015). Rather, personality differences can influence neurological activity (such as the experience of intense emotions; Larsen, 2000; Lucas & Baird, 2004), which can ultimately impact decision-making (Seo & Barrett, 2007). Thus, another important question to address is whether those high (vs. low) on dispositional greed differ in the activation of such processes, and whether such differences ultimately influence greedy behavior.

In order to address these questions and thus shed light on the mechanisms linking dispositional greed and greedy behavior, I use brain-imaging technology to test a conceptual model of greed proposed by Wang & Murnighan (2011). Organizational researchers have begun recommending alternative techniques (such as brain imaging) to examine moral behavior and moral decision-making (Kish-Gephart et al., 2010). Developments in brain imaging technologies, such as functional magnetic resonance imaging (fMRI), constitute an important advancement for ethics researchers as it provides “opportunity to more directly study nonconscious cognitive processing in morally charged situations” (Kish-Gephart et al., 2010: 22). Thus, adopting fMRI to explore the neurocognitive mechanisms that lead people to engage in greedy actions, and the potential for dispositional greed to further influence these mechanisms, constitutes an important contribution to greed research as well as the broader ethics literature. Further, understanding the motivational mechanisms promoting or dissuading greed likely requires a closer examination of how individuals make such decisions before examining implications of the broader organizational context (Wang & Murnighan, 2011). Indeed, as Wang and Murnighan (2011: 299) state, "the important theoretical and empirical question, then, becomes an identification of when and why one intuitive emotion is more likely to surface and dominate the other, i.e., the forces that determine whether people decide to succumb to or resist their greed." As such, the current study will be conducted in a laboratory setting using an allocation experiment and incorporating fMRI technology as a platform for testing the relationships between key variables.

In sum, drawing on dual-process theory (Chaiken & Trope, 1999; Reynolds, 2006) and recent models of greedy decision-making (Carnevale et al., 2016; Wang & Murnighan, 2011), I plan to utilize brain imaging technology to examine the influence of dispositional greed on greedy behavior via neurological activity. Specifically, I develop formal hypotheses testing the influence of dispositional greed on X-System activation (i.e., areas of the brain associated with emotion; specifically, the amygdala and ventral striatum), and further on greedy behavior (see Figure 1). Further, I adopt an exploratory approach to examine whether subsequent activation of the C-System (i.e., areas of the brain associated with controlled reasoning; specifically, the dorsomedial prefrontal cortex; dMPFC) can override individual's previous automatic and emotionally driven decisions, and whether dispositional greed strengthens or weakens this effect.

Contributions of the Study

My study contributes to the current literature in three ways. First, drawing on dual-process theory, I theorize and empirically test a neurocognitive model of greedy decision making linking dispositional greed with greedy behavior via emotional arousal. I suggest dispositional greed is positively associated with the activation of emotional processing, which in turn influences greedy behavior. Although prior research has theorized a relationship between greed and emotion (Carnevale & Walker, 2014; Wang & Murnighan, 2011), my study is among the first to empirically test this relationship. In doing so, I answer calls for research on greedy decision-making (Carnevale et al., 2016; Wang & Murnighan, 2011), and research adopting a neuroscience approach to examine the underlying processes influencing moral decision-making (Detert, Treviño, & Sweitzer, 2008; Kish-Gephart et al., 2010). Second, this research extends the nomological network of greed by examining potential neurological differences between those low (vs. high) on dispositional greed. I suggest that the components associated with dispositional greed – the constant desire for more, and the sense of never having enough – are associated with increased activation of emotional arousal, particularly areas of the brain involved in reward-seeking, desire, and insatiability (i.e., amygdala and ventral striatum). In doing so, I contribute to research exploring the relation between personality and changes in neural activity and emotional processing (Canli, 2004; Canli, Zhao, Desmond, Kang, Gross, & Gabrieli, 2001). Third, using an exploratory approach, this study contributes to dual-process theory by examining whether the activation of controlled processing (i.e., activity in the dorsomedial prefrontal cortex) can reverse, or temper, previous allocation decisions, as well as the potential for dispositional greed to further influence this relationship.

Structure of the Dissertation

To achieve the objectives of studying the relationships between dispositional greed, cognitive and emotional arousal, and greedy behavior, this dissertation is structured as follows. In Chapter 2, I review relevant literatures, including research on emotion in moral decision-making. I will then review research on greed, discussing the evolution of the construct and the importance of differentiating between the trait and behavioral approaches to greed. Finally, due to the novelty of brain imaging technology within the management field, I provide an overview of fMRI, its use in organizational research, and its applicability to the current study on greed. In Chapter 3, I review dual-process theory and present my hypotheses. Chapter 4 outlines the methodology used to test my hypotheses and research questions. Next, results of the study are discussed in Chapter 5. Finally, Chapter 6 provides a discussion of the theoretical contributions, limitations, and future directions of this research.

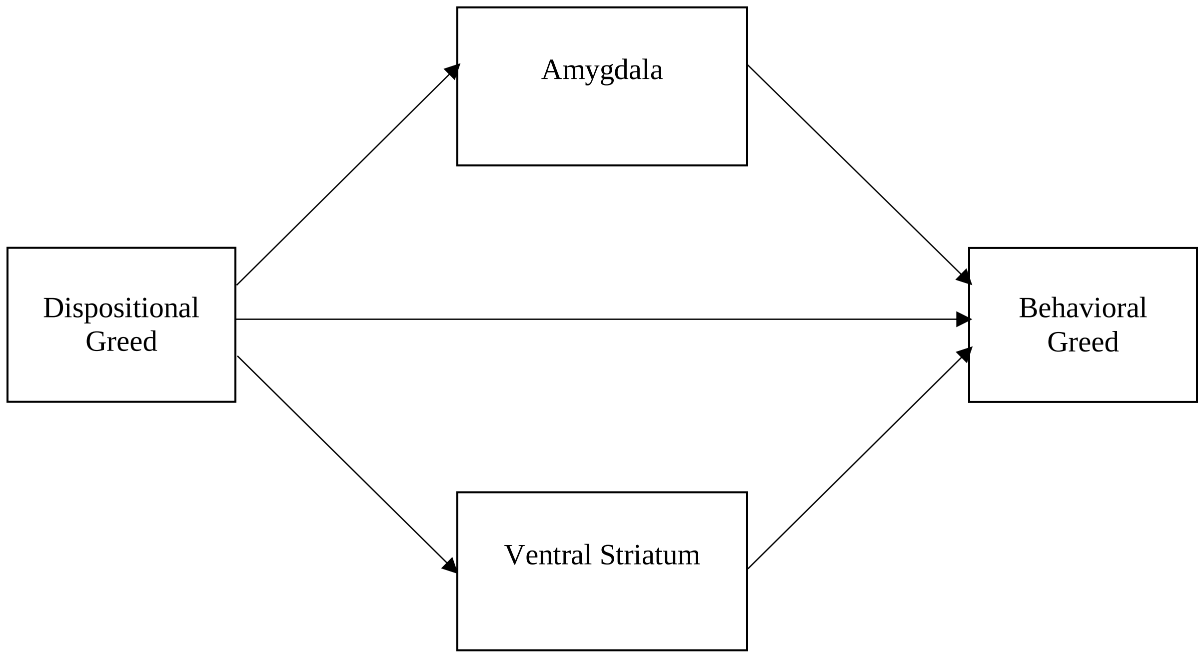


Figure 1. Proposed Research Model of Dispositional Greed and Greedy Behavior

Chapter 2

Literature Review

Overview

In the following sections, I discuss the intended contributions of my study by reviewing the empirical and theoretical gaps in the extant literature. I structure the literature review in the following manner.

First, I review research on the role of emotion in moral decision-making. I begin by reviewing early research viewing ethics from a rationalist perspective. I then discuss the recent inclusion of emotion in ethical decision-making, and its role in providing a foundation for the importance of studying the underlying cognitive and emotional mechanisms inherent to greedy behavior. Next, I review greed research, noting the evolution of the construct and the varying perspectives that have emerged. Specifically, I review research on greed as a *disposition* versus a *behavior,* delineating the differences across these perspectives, with specific attention towards the ways in which these approaches differ in terms of definition, conceptualization, measurement, and their relation to similar constructs (i.e., narcissism, Machiavellianism, and self-interest). Finally, I provide a brief background on brain imaging technology (i.e., fMRI), its recent adoption by management researchers, and its role in the current study.

The Role of Emotion in Moral Decision-Making

Early views on moral decision-making. Research on moral decision-making has flourished since Rest's (1979, 1986) development of the four-stage framework of ethical decision-making. According to his model, when faced with an ethical situation, individuals (1) become aware of an ethical issue, (2) make an ethical judgment, (3) establish moral intent, and finally (4) engage in an ethical action. As several scholars have noted (e.g., Jones, 1991; Reynolds, 2006), subsequent models tend to build off this four-stage process. For instance, Treviño (1986) suggests that personal and situational factors can interact to influence this process. Similarly, Hunt and Vitell (1986) argue for the inclusion of environmental factors (such as those social or organizational) in influencing ethical decision-making, and Jones (1991) further introduced moral intensity as an additional component influencing this process. These models are similar primarily in their view that moral decision-making constitutes a cognitive process, whereby individuals are assumed to behave as rational actors who carefully weigh information, reason in a sequential manner, and abstain from biases while making an ethical decision (Reynolds, 2006; Treviño, Weaver, & Reynolds, 2006). As evidence of the extent to which this rationalist perspective has been applied, one review of the ethics literature identified 179 studies that adopted either Rests' (1984) or Jones' (1991) framework (O'Fallon & Butterfield, 2005).

Emotion in moral decision-making. Although early research viewed ethics primarily from a cognitive perspective, there is growing consensus that many of our decisions, particularly those relying on moral judgments, are emotionally driven. For example, research has identified a number of emotional factors driving moral decision-making including affect (Mantel, 2005), active (e.g., anger), and passive (e.g., powerlessness) emotions (Connelly, Helton-Fauth, & Mumford, 2004), and anticipated emotions such as empathy, regret and guilt (Coughlan & Connelly, 2008; Detert et al., 2008). One area of research has examined the role of emotion within the moral decision-making process. Haidt's (2001) social-intuitionist model, for example, is among the first (and most notable) attempts to account for emotion in ethical decision-making.

His model suggests that individuals are often unaware of the underlying processes guiding their decisions, with moral situations evoking immediate, intuitive judgements. It is only in retrospect, as a means to justify their actions, that individuals use moral reasoning (Haidt, 2001). Other research suggests that individuals are more likely to make an ethical decision when they experience positive (versus negative) affect (Mantel, 2005). Further, research suggests that emotion influences the decision-making process in the form of biases, which can weaken cognitive processes, resulting in less favorable ethical decisions (Messick & Bazerman, 1996). Although this research accounts for the role of emotion in moral decision-making, much of this work still relies on the earlier rationalist frameworks. Indeed, as Tenbrunsel, & Smith-Crowe (2008: 586) suggest, in attempting to understand the role of emotions in ethical decision-making, "it is unlikely that new boxes and arrows can simply be added to existing models and theories. Rather, the existence of different types of models may lead to interesting new questions and insights that will shift the way we think about existing concepts."

Research suggests that dual-process theory offers one such way to inform new insights into the role of emotion and moral decision-making (Reynolds, 2006; Tenbrunsel, & Smith-Crowe, 2008). In fact, the growing interest in understanding the role of emotions in ethical decision-making can be largely attributed to the contributions derived from a dual-process perspective. For example, one of the primary reasons cited for the increasing interest in emotion in behavioral ethics is the advances in social and cognitive psychology that have provided evidence for the presence of competing processes influencing decision-making. More specifically, organizational researchers are beginning to acknowledge the growing evidence that our decisions (including those involving moral judgments) are a function of both emotional and cognitive processes operating often in opposition of one-another (Chaiken & Trope, 1999).

These developments have since informed a number of theoretical models of ethical decision-making including Moore and Loewenstein's (2004) theory of conflict of interest, Reynolds's (2006) neurocognitive model of ethical decision-making, Sonenshein's (2007) sensemaking-intuition model, and more recently Wang & Murnighan's (2011) model of greedy decision-making.

Although such theoretical developments have greatly enhanced our understanding of the interplay between cognition and emotion underlying moral judgements, my dissertation intends to add to this stream of research by empirically testing this dual-process perspective and its implications for greed. Before I expound on the model I will be testing, I first review research on greed, fMRI, and dual-process theory in order to further explicate the importance and relevance of the current study.

Greed as the Focal Construct

The topic of greed has a rich history in a variety of disciplines, most notably philosophy, economics, and public policy (Wang & Murnighan, 2011). While greed may be beneficial in some instances, such as promoting competition and innovation, historical accounts of greed primarily view the concept as destructive. For instance, early writers of philosophy, such as Plato and Aristotle, argued that greed not only harms others but also destroys one's own happiness (Balot, 2001; Furley, 2003). Greed also has a rich background in politics, having been viewed as a primary driver of war and destruction of civilized society (Berdal & Malone, 2000; Hobbes, 1968). In contrast to philosophical and political accounts of greed, economic literature tends to view greed in a more positive light. For example, according to neo-classical economic theory, individuals do, and *should*, maximize their own utility. However, without adequate distinction between one's needs and wants, this view suggests individuals should pursue their utility for utilities sake, thus allotting individuals full discretion on what is considered ‘need’ (Miller, 1999). However, this view has been tempered to some degree with Adam Smith’s distinction between rational self-interest and greed, where the former is viewed as a fundamental driver of economic progress and the latter is viewed as acquisitiveness taken to an excess that can impede both social and economic progress (Wang & Murnighan, 2011).

In contemporary society, greed is commonly referenced in the popular press following wakes of corporate scandals and corruption, and ascribed to acts of inequity and immorality by the general public (Wang & Murnighan, 2011). For instance, greed is often viewed as a fundamental factor influencing organizational corruption and unethical business practices, as it is frequently considered a leading driver of high-profile financial scandals such as Enron, WorldCom, and HealthSouth (Armenakis & Lang, 2013; Wang & Murnighan, 2011), as well as a motivating force underlying the recent financial crises (Hansen & Movahedi, 2010).

Despite this historical and contemporary attention, empirical research on greed is limited. One of the primary reasons cited for this lack of research is the difficulty in deriving an accurate definition of greed (Carnevale & Walker, 2014; Haynes et al., 2014; Wang & Murnighan, 2011). This conceptual confusion comes, in part, from the inherent difficulty in differentiating greed from similar concepts. Arguably, the closet construct to that of greed is legitimate self-interest. While most scholars agree that greed is self-interest taken to an excess, determining what constitutes ‘excess’, and thus a threshold clearly delineating ‘self-interest’ from ‘greed’, has yet to be clearly identified (Haynes et al., 2014; Wang & Murnighan, 2011). In attempts to overcome this issue, researchers have positioned ‘excessive’ as *behavior* (i.e., an observable action) that comes at a cost to others (e.g., Cozzolino, Sheldon, Schachtman & Meyers, 2009; Wang et al., 2011). However, as will be addressed below, research has not been consistent in this approach but has instead confounded greed's motivational implications with its behavioral consequences. That is, greed has been defined as both an underlying desire *and* the manifestation of behavior. Below, I review both of these approaches, and move toward reconciling these seemingly discrepant views.

Greed as a Behavior. Much of the early literature on greed examined the construct from a behavioral perspective. This is expected since most of this research originated from game theory, whereby the primary focus was on conflict and cooperation between individuals in a one-shot decision game. Having been primarily conducted within other academic disciplines such as economics, finance, and social psychology (Cozzolino et al., 2009; Eckel & Grossman, 1998; Eek & Biel, 2003; Wilke, 1991), this research has primarily examined situational factors influencing greed. For instance, researchers have identified a number of contextual factors with the potential for influencing greedy behavior including the amount of the desired outcome (Jin & Zhou, 2013), increased competition (Steinel and De Dreu, 2004), time horizon (Cozzolino et al., 2009), mortality salience (Jonas, Sullivan, & Greenberg, 2013; Cozzolino, Staples, Meyers, & Samboceti, 2004), and perceptions of fairness (Eek & Biel, 2003).

In their foundational work, Wang and Murnighan (2011) offered the first comprehensive review of greed research and its potential for organizational application. Similar to previous definitions which conceptualize greed as a manifestation of behavior, Wang and Murnighan (2011) define greed as "the acquisition of materialistic wealth, which also tends to be most relevant in organizational settings" (p. 282). Their study provided a theoretical model delineating the role of intuition, emotions, and cognition in greedy decision-making. An important implication of their study is that it laid the foundation for future research to explore "the dynamic interaction between the cognitive and emotional factors that [contribute] to greed" (p. 305). More specifically, in their model, they describe competing emotional processes (referred to as 'hot' vs. 'warm' emotions) that interact to influence greedy behavior. Hot emotions constitute one's acquisitive, impulsive, short-term desirability-driven hedonics, resulting in greedy tendencies, while warm emotions are less intense, and involve moral reasoning (e.g., empathy, regret, guilt), which can override initial greedy tendencies. As I'll discuss in a later section, these competing processes are consistent with the dual process perspective within cognitive psychology, and play an integral role in the current study.

While predominantly examined at the individual- and group-level, recent research on the behavioral implications of greed has been extended to the top management team. For example, Haynes et al., (2014) developed the construct of CEO greed, using executive pursuit of extraordinary compensation as a proxy for greedy behavior. Although previous research has largely relied on anecdotal accounts of CEO greed (e.g., Armenakis & Lang, 2014), their study was among the first to provide empirical evidence that greed "varies across individuals and can be captured through extraordinary perquisites, the relative pay gap between the CEO's and the next most highly paid top manager's pay and benchmarking specific CEOs' pay to known predictors of executive compensation" (p. 3). Haynes et al. (2015) further examine the implications of CEO greed on organizational performance. Specifically, they theorized that CEO greed is not only detrimental to long-term performance, but may also be associated with short-term financial decision-making, and turnover for nonperformance reasons (e.g., leaving to pursue higher compensation). In addition to greed's influence on corporate ventures, research has also explored the potential for managerial greed to manifest differently across entrepreneurial contexts such as small start-ups and entrepreneurial family firms (Haynes, Hitt, & Campbell, 2015).

Despite recent attempts to measure greed at the managerial level, lab studies have been the most common way to measure the construct under the behavioral approach. These studies rely largely on allocation experiments, such as public goods dilemmas – measuring giving/taking behavior via the amount allocated to a collective pool of resources, and dictator games – where one person is designated as the 'dictator' who decides the level of resource to distribute to another party (Wang et al., 2011). Common among these experimental designs is that individuals are provided a level of resources (e.g., money) and asked to distribute the resource between themselves and one or more individuals, or to contribute to a common pool of resources. Allocation experiments have been the method of choice due to their ability to determine, empirically, differences in giving and taking behavior. However, the limitation with this approach is that there is no consistent threshold as to what amount of giving and taking behavior is considered 'greedy' (Wang & Murnighan, 2011). As a result, extant research has adopted two approaches. The first approach sets a predetermined level to differentiate between egalitarian, rationally self-interested, and greedy behavior, whereby greedy behavior is typically viewed as keeping 50% or more of the available resources in the allocation experiment (Cozzolino, et al., 2009; Jonas et al., 2013; Wang, et al., 2011; Greenberg, 1982). However, there has been some variation in this predetermined level. For instance, greed has been operationalized as keeping 80% (Greenberg, 1982), 90% (Wang, et al., 2011), and 50% or more (Stanley & Tran, 1998) of the available resource. Alternatively, other studies focus on the differences in giving/taking behavior across their experimental condition (i.e., greed condition) and control groups as an indication of greed (Jonas et al., 2013; Kazemi, Eek and Garling, 2006; Rand, Greene and Nowak, 2012). Such an approach emphasizes the role of between-group differences in greedy behavior.

Greed as a Personality Trait. Although greed has only recently been studied as a personality trait (i.e., Seuntjens, et al., 2015; Krekels & Pandelaere, 2015; Mussel, Reiter, Osinsky, & Hewig, 2015), early research foreshadowed this approach by defining the construct in terms of its motivational implications. Wilke (1991) for instance defines greed as "[t]he desire to obtain the highest payoffs" (p. 168). Similarly, Kasser and Sheldon (2000) define greed as "a desire to [contribute] as little as possible to the common pool, to maintain personal resources (p. 389), while Steinel and De Dreu (2004) define it as "[t]he desire to get higher personal outcomes" (p. 420).

Even recent research on CEO greed suggests an underlying motivational tendency towards behaving greedy. For instance, Haynes, et al., (2014) define greed as "[t]he pursuit of excessive or extraordinary material wealth" (p. 3). It is important to note that pursuit indicates an underlying proclivity to behave greedily. Indeed, as they state, "pursuit, stemming from desire, implies the individual's inclination to actively participate in the compensation process" (p.3). However, the authors note that while they conceptualize greed as manifesting from an underlying desire, their focus is on outcomes realized (i.e., behavior), as this serves as a proxy of pursuit.

Only with the recent work of Seuntjens, et al., (2015), Krekels & Pandelaere, (2015) and Mussel, et al., (2015), has greed been developed from a purely dispositional conceptualization. Conceptualizing greed in this manner focuses on the motivational aspects of greed. Consistent across this perspective is the view that greed is an underlying insatiable *desire* for more. For instance, Krekels & Pandelaere, (2015, p. 225) define greed as "an insatiable desire for more resources, monetary or otherwise." Similarly, Seuntjens et al., (2015) define greed as "the tendency to always want more and never being satisfied with what one currently has" (p.1). This research has found a number of individual characteristics relating to greed including gender (male; Krekels, 2015), emotional instability, lower life satisfaction, lower self-esteem (Seuntjens et al., 2015), and higher risk preferences (Mussel, et al., 2015). It is important to note that this view of greed *does not* propose that individuals have a stable tendency to acquire or consume more resources – as *the latter would indicate a stable tendency toward greedy behavior* – rather, this view suggests that such individuals merely *desire* for more resources. Thus, although one may be predisposed to a greedy disposition, they may rarely act on this desire. Indeed, as defined, dispositional greed merely reflects a stable tendency to desire more and greater outcomes, and while such a disposition may cause individuals to focus on their own interests, and thus behave greedily, greed does not necessarily imply selfishness. As Seuntjens et al. (2014: 16) suggest, “self-interest is better seen as a consequence of greed, rather than a core of its experience... it follows from the acquisitiveness and the continuous desire for more.” For more information, see Table A, in Appendix B, for the list of items from Seuntjens et al.’s (2015) dispositional greed scale.

A review of the literature indicates that it is likely important to differentiate dispositional greed from similar constructs. Although the construct of self-interest closely parallels greedy behavior (as mentioned above), dispositional greed is likely most similar to the constructs of narcissism and Machiavellianism. Narcissism is considered a dark personality trait “encompassing grandiosity, arrogance, self-absorption, entitlement, fragile self-esteem, and hostility” (Rosenthal & Pittinsky, 2006: 617). Narcissism tends to be relational, as such individuals require attention from others in order to satisfy their insatiable need for adulation and admiration (Maccoby, 2000). However, because of their self-absorbed nature they are often unable to identify the needs in others (Rosenthal & Pittinsky, 2006). In contrast, dispositional greed, as currently conceptualized, is not necessarily relational, but instead constitutes an *internal* dissatisfaction with one's current situation. Machiavellianism is another inherently relational dark trait concerning "a strategy of social conduct that involves manipulating others for personal gain, often against the others' self-interest" (Wilson, Near, & Miller, 1996: 286). Although individuals scoring high on Machiavellianism are highly self-interested, a primary attribute of such individuals is their willingness to manipulate others to get what they desire (Wilson et al., 1996). Thus, although dispositional greed concerns a desire for more, it does not rely on interpersonal manipulation as a vehicle for achieving these desires.

In terms of measuring individual differences in dispositional greed three scales (two of which focus primarily on greed as an underlying desire) have recently been developed. These scales, (heretofore referred to as DGS1 and DGS2) operationalize greed as a form of insatiability (Seuntjens, et al., 2015; Krekels & Pandelaere, 2015). The items on the DGS1 and DGS2 overlap considerably. For instance, the following items from the DGS1 "it doesn't matter how much I have. I'm never completely satisfied" and "one can never have too much money." (Seuntjens, et al., 2015) parallel that of DGS2 items "no matter how much I have of something, I always want more" and "one can never have enough" (Krekels & Pandelaere, 2015), respectively. A third measure, recently developed by Mussels, et al., (2015), measures not only the underlying desire to obtain, but also one's tendency to *behave* greedily. Referred to as the Greed Trait Measure (GTM), it operationalizes greed as an internal desire as well as the tendency to act on that desire. This scale differs from the DGS1 and DGS2 in that it intends to capture the 'excessive' component incorporated in the other perspectives, in addition to an internal desire for more. For instance, the item "in order to get what I want, I can accept the fact that other people may suffer damage" and "when I play on my own, I sometimes cheat a little" take into account one's propensity to actually engage in the behavior.

Summary of Greed Research. Early conceptualizations of greed adopted a behavioral approach, whereby observable acts of the focal actor determined the presence of greed. The most common way of defining greed under this approach was to view it as behavior benefitting the self but that which comes at a cost to others. In this study, I remain consistent with previous research from the behavioral approach and define greedy behavior as *actions that benefit the self, and comes at a cost to – or otherwise deprives – others* (DeCelles et al., 2012; Wang & Murnighan, 2011).

Furthermore, recent research has begun to decouple the motivational implications of greed from its behavioral consequences. Consistent with this research, I define dispositional greed as the "*dissatisfaction of not having enough, combined with the desire to acquire more*" (emphasis added; Seuntjens et al., 2015: 12). Studying both greed's motivational implications and behavioral consequences is an important step in understanding greed in organizations for two primary reasons. First, if individuals do indeed differ in an underlying tendency to be greedy, then it follows that focusing exclusively on the behavioral perspective will result in an incomplete understanding of the construct. Second, viewing greed as a stable trait allows for a systematic approach at examining the construct (i.e., using validated surveys to assess individual differences in greed; Krekels, 2015). This latter point is particularly important for organizational researchers, as such an approach will allow for workplace application.

Moving forward, a number of questions remain regarding why and how individual's underlying motivations toward greed result in greedy behavior. Such questions will likely need to be addressed prior to examining the construct in an organizational context. Indeed, as Wang and Murnighan (2011) suggest "[a] true understanding of greed's pervasive effects might start with individuals and their decisions, but its broad implications will also need to incorporate the dynamics of organizations" (p. 307). Toward that end, in the following section I provide a brief overview of fMRI, its use in organizational research, and its applicability in understanding the link between dispositional greed and greedy behavior.

fMRI and its role in Organizational Research and Greed

Over the past few decades, the field of neuroscience has witnessed several technological and methodological advances that have allowed researchers to systematically locate and map brain areas associated with specific human behavior (for a history of these developments see Filler, 2009). Findings from this research reveals that specialized brain structures have evolved over millennia, with many of these structures devoted to specific functions of human behavior (Lieberman, 2007).

Although there are a number of methods used to examine changes in brain activity, fMRI constitutes one of the most widely used methods by researchers for several reasons, including its non-invasiveness, ease of use, and excellent spatial resolution (Jazzard, 2003). Developed in the 1990s by Seiji Ogawa and Ken Kwong, fMRI detects changes in blood flow occurring during neural activity. The standard technique used to generate the fMRI images is referred to as the blood oxygenation level dependent (BOLD) response. When an area of the brain is in use (e.g., during a task) there is an increase in blood flow to that area. Because blood is carrying oxygen on molecules of hemoglobin, and hemoglobin has iron in it, the magnetic field of the fMRI machine can detect the magnetic signature associated with the increased blood flow (Matthews, 2001). More specifically, when blood flow to an area of the brain increases, there is a momentary decrease in oxygenated hemoglobin and an increase in deoxygenated hemoglobin, which contain different magnetic properties. The BOLD response generates images based on the concentration of hemoglobin oxygenation (Jazzard, 2003).

Recently, organizational researchers have turned their attention to cognitive neuroscience in an attempt to apply these technological advances within their own research, with the intent to address the question: "[w]hat benefit can an understanding of the human brain have for the science and practice of management?" (Lee, Senior, and Butler, 2012; 921). In an effort to begin addressing this question, a number of articles have emerged outlining the potential implications, strengths, and limitations of a neuroscientific approach to organizational phenomenon. Becker, Cropanzano, & Sanfey (2011), for example, suggest that adopting a neuroscientific approach can aid in the understanding of a variety of workplace relevant phenomenon including attitudes towards organizational change, workplace discrimination, and goal directed behavior. Further, Becker and Cropanzano (2010: 1055) note fMRI's potential theoretical implications, suggesting that the adoption of such an approach "will undoubtedly move organizational behavior in the direction of unifying our theories because neuroscience identifies common neural processes across behaviors."

Yet, this research has also garnered skepticism from organizational scientists, particularly for the reductive assumptions central to a neuroscience perspective (Healey & Hodgkinson, 2014). Specifically, scholars have suggested that the predominant focus of individual differences (via brain processes) in explaining organizational phenomenon deemphasizes other important factors central to the workplace, particularly those situational in nature (Lindebaum & Zundel, 2013). A second, less problematic issue to overcome within this perspective is the appropriateness of using such methods. That is, in order for a neuroscience approach to be meaningfully applied to organizational research, the behavior being studied *must* have played an adaptive role in human's early development as a species (Becker et al., 2011; Lieberman, 2007). Stated differently, "for behavior and any activity in the brain to be related, that behavior *must* have played a beneficial role in our evolutionary development… because of the huge evolutionary cost of developing specialized brain areas" (Lee et al., 2012; p. 922).

Despite these concerns, organizational researchers are hopeful for the potential advantages fMRI can offer, and have begun to use the technique to explore poorly understood phenomenon. For example, researchers have used this technique to examine the differential nature of procedural and distributive justice (Dulebohn, Conlon, Sarinopoulos, Davison, & McNamara, 2009), the neural mechanisms associated with inspirational leadership (Molenberghs, Prochilo, Steffens, Zacher, & Haslam, 2015), and the association between empathy and Machiavellianism (Bagozzi, Verbeke, Dietvorst, Belschak, Rietdijk, 2013). Further, such techniques have garnered recent interest and endorsement from ethics researchers due to its potential to inform moral decision-making (Kish-Gephart et al., 2010).

Summary

It can be seen from this review that there is potential to advance the moral decision-making literature by studying the under-developed topic of greed, and the underlying processes that link its motivational implications with its behavioral outcomes. In particular, scholars have tended to confound the underlying desires to behave greedy with the behaviors that result from such desires. Only recently has a reliable measure for dispositional greed surfaced thus allowing for an initial test of this relationship (Seuntjens et al., 2015). My study seeks to advance this research by being among the first to study the relationship between dispositional greed and behavioral greed, and to further examine the emotional and cognitive mechanisms that mediate this relationship. Although empirically testing such processes constitutes a challenge for management scholars, recent advancements in brain imaging technology provide the opportunity to study the nonconscious processes underlying this relationship. In the following section, I elaborate on these processes and their role in greed research.

Chapter 3

Hypotheses

Building on previous theoretical models (Carnevale et al., 2016; Wang and Murnighan, 2011), I theorize and empirically test a dual-process model of greed. In this chapter, I first describe dual-process theory, its role in the broader context of decision-making, and its usefulness in understanding greed; I will then propose four hypotheses and two research questions.

Overview

The proposed study address two primary questions, “Is there a neural basis for dispositional greed?” and, “If so, do these differences influence greedy behavior? As mentioned earlier, I adopt both a descriptive and an exploratory approach to this research. As such, I present a formal model only for the descriptive portion of this study. More specifically, my model, shown in Figure 1, describes the relationship between dispositional greed, emotional arousal (via brain activity in the amygdala and ventral striatum), and greedy behavior. The exploratory portion of this study seeks to examine whether activation of more cognitive processes can override previous greedy decisions, and the role of dispositional greed in this relationship. Empirically testing a dual-process account of greed poses a significant challenge to scholars, as many of the processes underlying greedy behavior are implicit and subconscious. Responding to Wang and Murnighan’s (2011: 305) call for research exploring “the dynamic interaction between the cognitive and emotional factors [contributing] to greed”, I incorporate brain imaging technology (fMRI) to empirically test a dual-process model of greed.

Dual-Process Theory

In a broad sense, dual-process theory serves as a means to explain how a given phenomenon can result from two separate processes (Groves & Thompson, 1970). These processes are usually characterized as being either automatic (those fast and largely involuntary) or controlled (those slow and deliberate). Dual-process theory has been used to explain a variety of psychological, physiological, and organizational phenomenon such as memory (Smith & DeCoster, 2000), overconfidence (Mata, Ferreira, & Sherman, 2013), assessment of creativity (Elsbach & Kramer, 2003), and organizational strategy (Hodgkinson & Clarke, 2007).

Although the applicability of dual-process theory is not limited to neurocognitive phenomenon, it has been most notably applied to human cognition and decision-making (Evans, 2003). This research posits that separate brain areas are responsible for different functions, with our decisions ultimately dependent on which area is activated (Reynolds, 2006). Metcalfe and Mischel (1999), for instance, refer to the activation of a cool "know" system versus a hot "go" system when explaining processes influencing willpower and delayed gratification. Similarly, Mata et al. (2013) suggest that the ability for individuals to employ deliberate rather than intuitive reasoning when problem solving is important to avoiding overconfidence. Although researchers have adopted a variety of names for these separate processes, I refer to these systems as the X-System and C-System and will use them interchangeably with the terms automatic and controlled processes, and emotion and cognition, respectively (Reynolds, 2006).

The X-System corresponds to areas of the brain involved in instinctual, programmed responses to stimuli (Lieberman, 2007). Although a number of neural components comprise the X-System, the lateral temporal cortex, amygdala, and basal ganglia, are believed to be predominantly involved in automatic social cognition (Reynolds, 2006). Due to its early evolutionary development, the X-System is predominantly involved in emotional and motivational functions aiding early mammalian survival (MacLean, 1990). Indeed, the benefit of a rapid, instinctual response system offers an obvious selective advantage, as it can enable the organism to react quickly to environmental threats. The more recently evolved C-system, in contrast, corresponds to areas of the brain involved in slower, sequential reasoning (Lieberman, 2007). The C-System includes a number of outer-layer neural components involved in reflective social cognition, most notably the prefrontal cortex, medial parietal cortex, and the medial temporal lobe (Lieberman, 2007). Because of its ability to stimulate reflective, rule-based processing, the C-system is thought to play a particularly important role in situations requiring abstract reasoning such as moral judgement (Reynolds, 2007).

The presence of two distinct systems differentially influencing our decisions has prompted scholars to explore its potential to inform research on moral decision-making. An important implication of a dual-process perspective to moral judgement is that a key function of the C-system is to regulate the X-system. That is, the C-system activates in response to new information that challenges, or potentially supports, X-system judgments, with the potential to override or justify the initial judgements (Lieberman, Gaunt, Gilbert, & Trope, 2002). In terms of moral decision-making, if the X-system prompts an immediate, instinctual judgement to a given moral situation, the C-system might help to override this decision by, for example, processing potential ethical consequences or triggering a rule-based analysis (e.g., deontological, utilitarian, etc.). Thus, although previous models (e.g., Jones, 1991; Rest, 1986) suggest moral decision-making is a linear process, a dual-process perspective recognizes the potential for such decisions to be an iterative process.

Dual-process theory also has important implications for greed (Wang & Murnighan, 2011). Specifically, the theory suggests that the initial automatic reactions accompanying situations requiring an agent to choose between their own interests, and the interests, of others, tend to be self-serving (Bazerman & Chugh, 2006; Moore & Loewenstein, 2004). Simply stated, X-system processing tends to promote self-interested decisions. The explanation for why automatic processes tend to elicit self-serving behavior can be best explained from an evolutionary perspective, as the ability to react quickly to the environment in a manner that benefits the self provides an obvious selective advantage (MacLean, 1990; Wu, Sacchet, & Knutson, 2015). However, given the regulatory function of the C-system, research suggests that initial proclivities to behave greedy may be tempered with post-hoc deliberation. Although Wang and Murnighan (2011) use the term 'warm emotions', they suggest that the presence of more controlled processes can elicit feelings of guilt, and regret, which can reverse or augment initial greedy decisions to those socio-moral in nature. With these arguments in mind, I theorize and test the potential for dispositional greed to differentially influence automatic and controlled processes, and in turn influence greedy behavior.

Dispositional Greed and Greedy Behavior

Before I begin explicating the role of automatic and controlled processes underlying dispositional greed and greedy behavior, I first theorize a direct relationship between these constructs. Intuitively, increases in dispositional greed should be associated with engaging in actions that benefit the self. There are several theories that would suggest such underlying tendencies will manifest into self-serving behavior. The theory of reasoned action (Ajzen & Fishbein, 1977), for example, suggests that one's attitude towards a certain behavior is an important precursor to whether the individual will be motivated to engage in the behavior.

Although dispositional greed merely indicates a desire for more and greater outcomes, the persistent focus on obtaining more is likely to manifest into self-enhancing actions. For example, Wang et al. (2011) emphasized the importance of an individual's attitudes on their subsequent greedy behavior, finding, for instance, that economics training was associated with favorable attitudes towards greed, and towards one's own greedy behavior. Like Wang and Murnighan (2011), Haynes, et al., (2014) argued that these attitudes are a critical influence on the tendency to behave greedily. Indeed, results of their qualitative analysis suggests that greed "is an underlying latent construct that *begins with desire*, and might be followed by the *disposition to act on the desire*" (p. 3) (emphasis added). Further, Carnevale et al., (2016) draw on control theory to explain the relationship between these constructs. Control theory (Direnzo & Greenhaus, 2011) posits that behavior is influenced by a perceived gap (i.e. discrepancy) between one's current state and desired state. According to Carnevale et al. (2016: 2), those scoring high on dispositional greed "will likely (a) perceive their inputs (i.e., current resources of money, power, influence, etc.) as insufficient, (b) desire a goal state inherently higher than their present state, (c) possess a goal state inherently higher in comparison to most other individuals, and (d) as a result of a – c, be more likely to detect a discrepancy." As a result, dispositional greed is likely to motivate individuals to engage in behaviors that can reduce the perceived discrepancy (i.e., resource acquisition). Taken collectively, I hypothesize the following:

Hypothesis 1: Dispositional greed will be positively related to greedy behavior.

Before I continue, I feel it is important to first explain the allocation task used to measure greedy behavior, as well as the use of a self-focused and other-focused conditions in the subsequent theorizing and hypotheses development. First, in order to measure greedy behavior, I will use an allocation task requiring participants to distribute $100 between themselves and a chosen charity. Participants will be asked to decide how they will distribute the $100 at two times, when they first enter the scanner – which will serve as the dependent variable (behavioral greed) – and before they exit the scanner – which is needed to calculate the dependent variable in the exploratory study: ‘change in behavioral greed’.

To test the relationships between dispositional greed, brain activation, and greedy behavior in the formal model, as well as the influence of brain activation on the change in behavioral greed in the exploratory study, participants will be exposed to two conditions that are intended to stimulate brain activity in the regions of interest (i.e., X-system and C-System). More specifically, in order to obtain a measure of amygdala, and ventral striatum activation, as well as a measure of dMPFC activation, participants will be exposed to a ‘self-focused’ condition and ‘other-focused’ condition, respectively. Each participant will first be presented with the self-focused condition prior to making their first allocation decision. The self-focused condition involves asking participants to imagine they will spend all $100 on *themselves* and then presenting participants with a series of highly appetitive images. Specifically, participants are presented with a series of consecutive pairs of images and, for each pair, asked to select the image that best represent how they would spend the $100 on themselves (see Figure 2, below, for an example). Participants will then make their first allocation decision. At the end of the experimental protocol, participants will be told that they have the opportunity to reevaluate their previous allocation decision. Before deciding one final time how they will distribute the $100 between themselves and a chosen charity, participants will be provided the other-focused condition. The other-focused condition involves asking participants to imagine they will spend all $100 on *someone else* and then presenting participants with a series of images meant to elicit an empathic reaction (see Figure 3, below, for an example). Specifically, participants are presented with a series of consecutive pairs of images and, for each pair, asked to select the image that best represent how they would spend the $100 on someone else. Participants will then make their final allocation decision. Figure 4 presents a visual description of the study protocol.

The conditions are needed in order to acquire a reliable measurement of brain activity, and is consistent with previous fMRI research associating personality with brain activation (Canli, 2004; Canli et al., 2001; Fan, Wonneberger, Enzi, De Greck, Ulrich, Tempelmann, Bogerts, Doering, & Northoff, 2011; Preston & De Waal, 2002). More specifically, because there is a delay in the delivery of blood to active neuronal tissue (what is referred to as the hemodynamic response), obtaining brain activity of interest is difficult without a consistent, repetitive task. Having participants continuously select images that best represents how they would spend the $100 on themselves (others), should provide enough time for the scanner to capture brain activity. It is important to note that the current study will *not* be randomly assigning participants to each condition. Rather, all participants will be first subjected to the self-focused condition, and then to the other-focused, and these conditions will be included in the formal hypotheses. Thus, any brain activity resulting from the two conditions will be systematic across participants. I will then be able to examine the influence of dispositional greed on the degree of X-System activation, and its subsequent effect on greedy behavior, as well as the role of the C-System in the exploratory study. I further discuss the details of these conditions in Chapter 4.

Please select the image that best represent how you would spend this $100 on yourself.

Figure 2. Sample Stimuli for the Self-Focused Condition

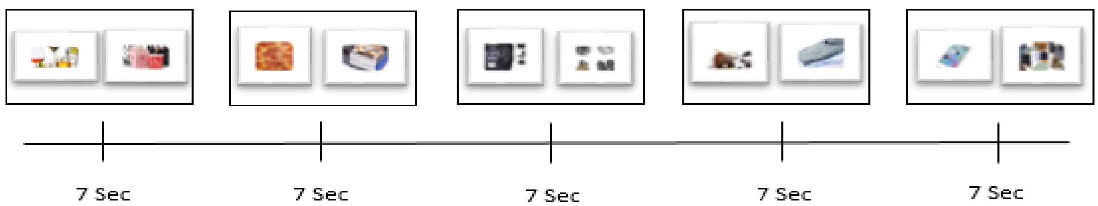
Please select the image that best represent how you would spend this $100 on someone else.

Figure 3. Sample Stimuli for the Other-Focused Condition

Instructions
As part of the current study, you will receive $100. In the upcoming section, you will receive information regarding the $100. In fact, you can obtain all $100 before you leave here today.

Self-Focused Condition
Before continuing, we would first like you to imagine that you will spend all $100 on yourself. Furthermore, imagine how you would spend this $100 on yourself. Please use the next 60 seconds to imagine how you would spend this money on yourself.

Continue to imagine that you will spend all $100 on yourself. Below you will see several sets of images. For each pair, please select the image that best represent how you would spend this $100 on yourself.



Allocation Decision
We are providing you with $100 to allocate between yourself and a humanitarian charity. You are given full discretion regarding how you will allocate the money between yourself and the charity that you chose. You may, for instance, keep all $100, give all $100 away, or allocate any amount in between that you wish. After you make your decision whatever amount you decided to retain for yourself will be given to you before you leave today. Any information regarding your decision will remain strictly confidential.

Using the slider bar below, please decide how you will distribute the $100. After making your decision, please select a charity below (if applicable).

Click anywhere in the slide bar area (i.e., using the big red dot) to indicate your allocation decision

0 10 20 30 40 50 60 70 80 90 100

How much you will keep

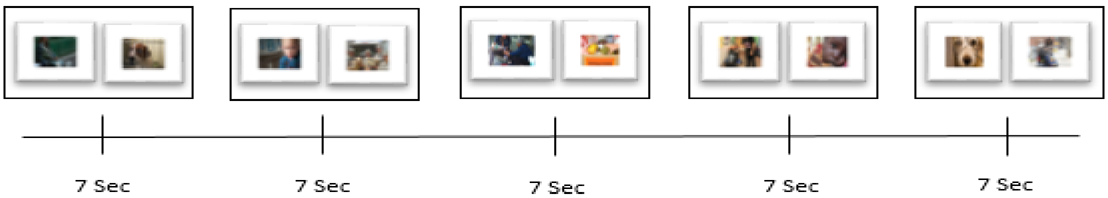
Please select a charity below...

- American Heart Association: Mission is to reduce death caused by heart disease and stroke
- Lee County Food Bank: Mission is to alleviate hunger in east Central Alabama
- St. Jude's Hospital: Mission is to advance cures and means of prevention for pediatric catastrophic diseases
- Susan G. Komen: Mission is to save lives and end breast cancer forever
- Wounded Warrior Project: Mission is to raise awareness and enlist the public's aid for the needs of injured service members

At this point the subject will participate in a series of tasks unrelated to the current study.

Other-Focused Condition
Before we continue to the final section, we would first like you to imagine that you will spend all $100 on someone else. Furthermore, imagine how you would spend this $100 on someone else. Please use the next 60 seconds to imagine how you would spend this money on someone else.

Continue to imagine that you will spend all $100 on someone else. Below you will see several sets of images. For each pair, please select the image that best represent how you would spend this $100 on someone else.



Allocation Reevaluation Decision
Below you are given one final opportunity to change your decision on the previous allocation task. Using the slider bar below, please decide how you will distribute the $100.

Using the slider bar below, please decide how you will distribute the $100. After making your decision, please select a charity below (if applicable).

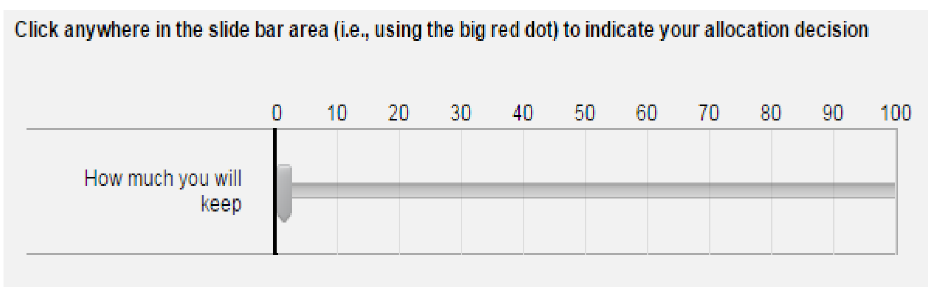


Figure 4. Visual Timeline of the fMRI Study Protocol

Activation of Greed and X-System Processing

Dispositional Greed and the X-System. Prior research has long recognized the potential of stable personality traits in contributing to one's affective processing (Costa & McCrae, 1980; Larsen & Ketelaar, 1991). For instance, individuals differ not only in their sensitivity to negative and positive cues (Larsen & Ketelaar, 1991), but also in how intensely they respond to emotional events (Larsen, Diener, & Emmons, 1986). Building on this work, research has begun to examine whether certain traits are associated with changes in neural activity (Canli, 2004; Canli et al., 2001). This research, for instance, has explored gender differences in brain activation in response to recalling sad and happy events (George, Ketter, Parekh, Herscovitch, & Post, 1996), and procedural and distributive justice manipulations (Dulebohn, Davison, Lee, McNamara, & Sarinopoulos, 2016).

Canli et al., (2001) were among the first to explore potential individual differences in the biological basis of emotion, finding variations in brain activity across extraverted and neurotic participants. They found that personality measures of neuroticism and extraversion were associated with changes in brain activation when exposed to positive and negative stimuli. More specifically, their results demonstrated that extraverted individuals experienced heightened activation of the amygdala and cingulate cortex when viewing positive images (e.g., images of puppies, food, ice cream, etc.), whereas neurotic individuals experienced activation primarily in the temporal and frontal lobes when viewing negative images (e.g., images of guns, spiders, cemeteries, etc.). Their study suggests that the degree to which an individual is extraverted or neurotic has profound influence over their experience of emotional arousal in response to positive and negative stimuli.

Building on this research, I suggest that dispositionally greedy individuals may experience differences in brain activation in response to situations that focus their attention on the self (i.e., self-focused condition). Although not specifically addressed in the extant literature, the components of dispositional greed, specifically, the constant desire to acquire more than what one currently has, and the sense of never having enough (Seuntjens et al., 2015) should relate to activation of specific brain areas involved in automatic processing, particularly areas sensitive to reward seeking, desire, and insatiability. These brain areas include the amygdala and ventral striatum (a sub-region of the basal ganglia; Phillips, Drevets, Rauch, & Lane, 2003). As mentioned, these areas play a key role in the processing of emotions and are part of the subcortical structures that comprise the X-system.

Neuroscience has identified the amygdala as a key area implicated in automatic processing (Bechara & Damasio, 2005). Research on the function of the amygdala dates back to the seminal work by Klüver and Bucy (1937) which found that damage to the amygdala within Rhesus monkeys resulted in fearless behavior. Although originally thought to be primarily involved in the processing of fear, research has since demonstrated that the amygdala also plays an important role in the processing of positive information (Cunningham & Brosch, 2012; Hamann, Ely, Hoffman, & Kilts, 2002). For example, Hamann et al., (2002) found that participants experienced increased amygdala activation while observing appetitive, positive images. Amygdala activation has also been implicated in processing emotional aspects of rewards (Bechara, 2005), including its valence and value (Murray, 2007). Although money does not have intrinsic affective properties, research suggests that "exposure to monetary reward triggers affective signals through the amygdala system" (Bechara, 2005; p. 1459). Additionally, because of its role in regulating behavioral and physiological arousal, the amygdala has been implicated in impulsivity (Brown, Manuck, Flory, & Hariri, 2006). Although impulsiveness is not an explicit component of dispositional greed, research suggests it may play an important role as increases in dispositional greed correlates strongly with less self-control, higher impulsivity, and higher buying impulsivity (Seuntjens et al., 2015).

In addition to the amygdala, I also expect those high on dispositional greed to experience greater activation of the ventral striatum (i.e., nucleus accumbens). The ventral striatum is an area involved in reward processing and motivation (O'Doherty, Dayan, Shultz, Deichmann, Friston, & Dolan, 2004), and has been found to play an instrumental role in desire (Lutz & Widmer, 2014). Specifically, the ventral striatum has been found to play a key role in the experience of positive arousal during the anticipation of both monetary and nonmonetary (e.g., viewing erotic images) rewards (Knutson, Wimmer, Kuhnen, & Winkielman, 2008). Together, the amygdala and ventral striatum represent core structures related to reward processing, as these two regions are coactivated in the processing of sensory information involving reward expectation (Haber, 2011). Further, research suggests that the level of reactivity in the ventral striatum is influenced by the *size* of the outcome, such that anticipation of greater levels of potential reward are associated with increased ventral striatum reactivity (Diekhof, Kaps, Falkai, & Gruber, 2012; Elliott, Friston, & Dolan, 2000; Wu et al., 2012). Thus, individuals with an insatiable desire for higher outcomes may experience greater activation in this region.

Based on current conceptions of dispositional greed regarding extraordinary desire for gains, and the insatiable drive to acquire those gains (Seuntjens et al., 2015), the neural activity of those high (vs. low) on dispositional greed should differ in response to the self-focused condition. Consequently, I propose that in response to information that focuses the attention on the self, those scoring higher (lower) on dispositional greed will show greater (lesser) activation in the X-System, particularly the amygdala and ventral striatum. Accordingly, I hypothesize the following:

> *Hypothesis 2: When prompted to consider their own interests, individuals high (low) on self-reported dispositional greed will experience greater (lesser) activation of the X-system, specifically, I expect this correlation to be most prominent in the amygdala and ventral striatum.*

Dispositional Greed, the X-System, and Greedy Behavior. In addition to the potential for dispositional greed to activate the X-System in response to the self-focused condition, I further consider the potential for such heightened emotional activation to motivate greedy behavior. Prior research suggests that the experience of heightened emotional arousal can serve as an important behavioral motivator, with the potential to alter one's choice of action (Seo, Barrett, & Bartunek, 2004). Intuitively, individual differences in insatiability should be related to keeping more in an allocation task. What is relatively unknown is the neural mechanisms underlying this relationship. Building on previous research exploring the emotional and cognitive underpinnings of greed using a dual process perspective (Wang & Murnighan, 2011), I focus on greedy behavior as a distal outcome of dispositional greed via emotional arousal (i.e., activation of the amygdala and ventral striatum).

As previously mentioned, Wang and Murnighan's (2011) model of greedy decision-making was among the first to theorize greed from a dual-process perspective. A dual-process theory of greed suggests that emotion and cognition are important drivers of prosocial behavior, with the activation of the former motivating self-interested tendencies and the activation of the latter motivating socio-moral tendencies (Wang & Murnighan, 2011). Although Wang and Murnighan (2011) use the term 'hot emotions' to describe automatic processes, their conceptualization is consistent with neuroscience research linking the activation of subcortical structures with behavior. More specifically, the rapid and short-lived activation of the amygdala (and further on the ventral striatum; see Bechara, 2005, p. 1459; Stuber et al., 2013) is found to promote physiological and behavioral responses (Cardinal, Parkinson, Hall, & Everitt, 2002). Activation of these areas can influence general (approach-oriented), as well as specific (reward-seeking) behavior. For example, according to the anticipatory affect model (Knutson & Greer, 2008), subcortical activation resulting from an incentive cue further elicits either an approach (during positive arousal) or avoidance (during negative arousal) behavioral response from the individual. More specific with regards to the current discussion, research has also found subcortical activation of the amygdala and ventral striatum to facilitate reward-seeking behavior (Stuber et al., 2013). Furthermore, this reasoning closely parallels recent research examining the cognitive and behavioral consequences of motivational intensity (Harmon-Jones, Gable, & Price, 2012), which suggests that situations evoking intense desire to obtain a resource (e.g., monetary incentives) can narrow one's focus towards goal attainment (e.g., acquiring the monetary incentive). Taken together, these arguments suggest dispositional greed will be positively associated with greedy behavior, and this relationship will be mediated by heightened emotional activation. I thus hypothesize the following:

> *Hypothesis 3: Activation of the X-system (i.e., activity in the amygdala and ventral striatum) will be positively associated with greedy behavior (i.e., keeping more on the allocation decision).*

> *Hypothesis 4: Activation of the X-system (i.e., activity in the amygdala and ventral striatum) will mediate the relationship between dispositional greed and greedy behavior.*

Deactivation of Greed and C-System Processing

Thus far, I have argued that dispositional greed will be associated with greater X-system activation, which will in turn promote greedy behavior. Consistent with a dual process perspective, I further explore whether the activation of controlled processes can alter these initial decisions. Specifically, I explore whether the activation of the C-System (particularly brain activity in the dMPFC) in response to situations that focus one's attention on others will lead to a change in behavioral greed (i.e., less greedy decisions relative to the previous decision). I further explore whether this effect will differ based on dispositional greed.

According to a dual-process approach to moral decision-making, an important function of the C-System is to regulate the X-System (Reynolds, 2006). In terms of greed, although automatic processes involving intense, impulsive emotions can initially promote greedy behavior, given the opportunity, the presence of more controlled processes can potentially reverse these initial judgments. As Wang and Murnighan (2011) suggest, "a moral emotion like guilt can also create internal feelings, which, when strong enough, will effectively limit greed and other self-interested actions" (p. 303). While they refer to these processes as "warm emotions", their conceptualization involves the presence of empathy, guilt, and regret which remains consistent with specific functions of the C-system. Although there are a number of brain areas involved in C-System processing (Lieberman, 2007), I focus on a specific area – the dMPFC, due to its notable role in the experience of empathy and perspective taking of others (Powers, Chavez, & Heatherton, 2015).

Neuroscience has implicated areas associated with the dMPFC in controlled processing (Reynolds, 2006). Neuroimaging studies have consistently demonstrated dMPFC activation when people make social judgments or when 'mentalizing' about the minds of others (Denny, Kober, Wager, Ochsner, 2012; Iacoboni et al., 2004; Mitchell, Heatherton, McRae, 2002; Mitchell, Macrae, Banaji, 2004, 2006). One meta-analysis of 107 studies, for example, identified the dMPFC as a key brain area implicated in the inference of others mental states (Denny et al., 2012). The ability to reflect on others' well-being and needs is considered instrumental in dissuading greedy behavior (Wang & Murnighan, 2011). Furthermore, activation of the MPFC has also been implicated in the experience of guilt and embarrassment (Takahashi et al., 2004), two moral emotions theorized to be important in overriding initial greedy tendencies (Wang & Murnighan, 2011).

The idea that activation of the C-System is associated with altruistic tendencies is nothing new. Indeed, research has shown that activation of the C-System, particularly the dMPFC, predicts monetary donations and the propensity for helping behavior (Brosch, Coppin, Scherer, Schwartz, & Sander, 2011). What is relatively unexplored is whether such activation can reverse, or temper, previous allocation decisions. This is surprising, given that most dual-process models of moral decision-making, including those involving self-interest and greed, suggest that the C-System serves a key regulatory function (Lieberman et al., 2004; Reynolds, 2006; Wang & Murnighan, 2011). As an initial test to this key assumption to dual-process theory, I explore whether activation of the dMPFC will reduce greedy behavior (relative to the previous decision).

I further explore the role of dispositional greed in moderating this relationship. The idea that the influence of dMPFC activation on the reevaluation decision will differ based on individuals' dispositional greed is predominantly exploratory in nature. However, there is some evidence for this perspective from the motivational dimensional model of affect (Gable & Harmon-Jones, 2010), which suggests that high motivational intensity can narrow one's focus to exclude information irrelevant to goal achievement. For example, Gable and Harmon-Jones

(2008) found that viewing appetitive stimuli resulted in decreased breath of attention, suggesting that highly desired stimuli reduced individual's ability (and perhaps motivation) to seek out new information or other perspectives**.** In terms of dispositional greed, this view would suggest that such individuals with a tendency to always want more than they currently have may be less sensitive to goal-irrelevant information – such as the needs and concerns of others. If so, then it stands to reason that those scoring high on dispositional greed should be less sensitive to information that requires them to consider the interests of others. Such evidence for differences in personality and brain areas associated with empathy has been found for narcissism, with highly narcissistic individuals experiencing decreased activity in areas of the brain involving the experience of empathy (Fan et al., 2011). As previously mentioned, greed is conceptually distinct from narcissism; however, they both share a common tendency for an excessive desire to satisfy their own needs. I thus pose the following research questions:

RQ1: Will activation of the C-System (i.e., activity in the dorsomedial prefrontal cortex) be positively related to a change in behavioral greed?

RQ2: Will this effect will be weaker for individuals high (vs low) on self-reported dispositional greed?

Chapter 4

Method

Study Sample

I invited a total of 1,147 undergraduate students taking an introductory management course drawn from a large university in the southeastern United States to participate in the study. Data was collected at two time points (Time 1 = survey; Time 2 = fMRI) with a minimum time lag of 1 week. At Time 1 (survey), 1,147 participants were provided with measures assessing their dispositional greed, reward responsiveness (control), age (potential contraindication), and handedness (potential contraindication). Of the 1,147 invited participants, 809 agreed to participate (70.5% response rate). Each participant received extra credit from their respective instructor for their participation in the survey. The data collected from the survey was needed in order to screen participants for the experiment (neuroimaging study; screening parameters discussed below), as well as to examine in conjunction with imaging data.

After a 1-week minimum time lag, I invited participants from the survey who met the screening criteria to participate in the brain imaging study. Specifically, the survey screened for right-handed participants, because handedness can contribute to significant variability in brain imaging data. In addition, the survey screened for gender (males), as gender is a known predictor of greedy behavior (e.g., Wang et al., 2011). Further, participants were screened based on age (55 years of age or younger), because of the complex changes that occur at the neurophysiological level as a result of healthy aging. Finally, in order to test potential group differences between low and high dispositional greed on brain activation and greedy behavior, participants were screened based on their dispositional greed scores. Specifically, in addition to the above stipulations, only those participants who scored below the first quartile (≤ 2.57) and above the third quartiles (≥ 3.43) were considered for the fMRI study.

Of the 809 participants who completed the survey, 372 met the first screening criteria (right-handedness, and male) needed for the fMRI study (46.0%). Of the 372 participants who met the screening criteria, 240 indicated (within the survey) that they would like to be considered for the fMRI study (64.5%). Of these 240 participants, 99 participants fell below the first quartile (49 participants) and third quartile range (50 participants), thus meeting the second screening criteria (41.3%). Of these 99 participants, 73 were invited to participate in the fMRI study. Finally, of the 73 participants who were invited, 21 participated (28.8% response rate). Of the 21 participants, 1 participant, upon completion of the study, reported knowing elements of the study design, and 1 participant's brain imaging results failed to register. These two subjects were subsequently dropped from the sample. Thus, the total sample size for the brain-imaging study was 19 (10 low-greed, 9 high-greed). The dispositional greed scale is measured on a likert scale from 1, indicating low greed, to 5, indicating high greed. The average dispositional greed score across my low-greed condition was 1.99 (range 1.43 – 2.14), while the average across my high-greed condition was 3.92 (range 3.57 – 4.43).

Experimental Design

There was at least a one-week time lag between completing the survey and participating in the brain imaging study. All experimental protocols gained approval from the Institutional Review Board of Auburn University prior to scanning participants. Upon meeting the above requirements, participants arrived one at a time to the testing center. Prior to entering the scanner, participants were asked to complete an Informed Consent Form. If consent was granted, the participant was then asked to fill out the MRI Pre-Entry Screening Form. The MRI Pre-

Screening Form was needed to screen participants for potential contraindications (i.e., a permanent retainer, body piercings that cannot be removed, any metal in their body, a pacemaker or any implant that is magnetically or electronically activated). Upon meeting the above criteria, participants were scanned of any metallic objects and placed into the scanner to begin the study. The protocol tasks were displayed on a computer screen accessible to the participants while inside the scanner. They were also provided a hand-held remote, which allowed them to make selections and answer questions while undergoing scanning.

In order to obtain a baseline level of neural reactivity, once in the scanner, participants were first asked to remain calm and relaxed with their eyes closed for 1 minute. Following this, the investigator left the room and the computerized tasks initiated. Participants were then immediately informed of the potential to earn $100. However, before they were asked to allocate this sum between themselves and a charity, participants were asked to complete the self-focused condition (described in-depth below). The self-focused condition was intended to evoke brain activity within the specific areas of interest (i.e., the amygdala and ventral striatum). Participants were then asked to complete the first allocation task intended to capture behavioral greed (i.e., the dependent variable in the formal model). Specifically, participants were asked to distribute $100 between themselves and a chosen charity. After making their decision, participants once again were asked to remain calm and relaxed with their eyes closed for 1 minute while the machine captured an additional baseline level of neural reactivity. Participants than completed a series of unrelated tasks lasting approximately 12 minutes. Following these tasks, participants were then asked to complete the other-focused condition (described in-depth below). The other-focused condition was intended to evoke brain activity within the specific area of interest (i.e., the dMPFC). After the other-focused condition, participants were asked to reevaluate their previous decision in the allocation task, which was intended to capture the change in behavioral greed (i.e., the dependent variable in the exploratory study). Specifically, participants were informed of the opportunity to change their previous decisions, and as such, were asked once again to decide how they would distribute the $100 between themselves and a charity. Finally, participants once again were asked to remain calm and relaxed with their eyes closed for 1 minute while the machine captured an additional baseline level of neural reactivity. Following completion of the study protocol, participants were provided the entire $100, a debriefing form, and a list of charities and contact information. Each participants' respective instructor was then notified of their participation in the study in order for them to earn the extra credit for participating. Figure 4 in presents a visual description of the study protocol.

Psychological Measures

Dispositional Greed. To assess variability in individuals' motivations to behave greedy, participants' dispositional greed was measured with the 6-item self-report dispositional greed scale (DGS) developed by Seuntjens, et al., (2015). Participants were asked to rate the extent to which each item characterizes a description of themselves on a 5-point scale ranging from "1 = strongly disagree" to "5 = strongly agree." Sample items include "It doesn't matter how much I have. I'm never completely satisfied," "actually, I'm kind of greedy," and "I always want more." Seuntjens, et al., (2015) found this scale to be reliable with a Cronbach's alpha of .90. In the present study, this scale was found to have acceptable reliability with an alpha of .78. As mentioned, I captured the upper ($\geq$ 3.43) and lower ($\leq$ 2.57) quartiles of participants' dispositional greed scores. The final variable was then dichotomized, with participants below the first quartile coded as 1 (N = 10), and participants above the third quartile coded as 2 (N = 9).

Controls. To alleviate potential confounding effects, I controlled for variables shown to be related to emotional processing and behavioral greed. First, I controlled for individual differences in sensitivity to emotional processing. Specifically, because individuals are known to differ in terms of their sensitivity to positive stimuli such as rewards (Carver & White, 1994; Gray et al., 2005), I controlled for variations in *reward responsiveness* using the 5-items from the 20-item self-report BIS-BAS scale developed by Carver and White (1994). Participants were asked to rate the extent to which each item characterizes a description of themselves on a 4-point scale ranging from "1 = strongly agree" to "4 =" strongly disagree". A sample item includes "When I get something I want I get excited and energized." This scale has been found to have moderate reliability with a Cronbach's alpha of .73 (Carver & White, 1994). In the present study, this scale was found to have acceptable reliability with an alpha of .74. In addition, research has also found gender to be a consistent predictor of self-interested/greedy behavior (Eckel & Grossman, 1998; Wang et al., 2011), thus I controlled for gender by only including males in the neuroimaging portion of the study.

X-System and C-System Measures

fMRI Data Acquisition. Blood-oxygen level-dependent (BOLD) signal changes (Ogawa, Lee, Nayak, & Glynn, 1990) were acquired on a Siemens 7T MAGNETOM outfitted with a 32- channel head coil at the Auburn University MRI Research Center (AUMRIRC). Functional images were acquired using a single shot echo planar imaging (EPI) sequence (TE = 28msec, TR = 3000msec, flip angle = 70°, Voxel size = 0.85 mm x 0.85 mm x 1.5 mm). A total of 110 interleaved slices were acquired for the run involving the self-focused condition, and a total of 100 interleaved slices were acquired for the run involving the other-focused condition, with a total acquisition time of 10:30min (5:30min for the self-focused condition run and 5min for the other-focused condition run). For registration purposes, a T1 weighted three-dimensional image was acquired using a magnetization-prepared rapid acquisition gradient (MPRAGE) sequence (TE = 28msec, TR = 2200msec, flip angle = 70°, Voxel size = 0.85 mm x 0.85 mm x 1.5 mm). A total of 256 interleaved slices were acquired.

fMRI Data Preprocessing. All participants completed the protocol in the sequence described above. Analyses were carried out using the fMRIB Software Library (FSL; http://www.fmrib.ox.ac.uk/fsl; Jenkinson, Beckmann, Behrens, Woolrich, & Smith, 2012). Prior to running the analyses, all non-brain tissue matter was removed from the anatomical images using the brain extraction tool (BET). I then conducted a number of preprocessing steps, including slice-time correction (interleaved), motion correction with MCFLIRT, and spatial smoothing (FWHM at 5mm). These analyses are necessary to correct for temporal differences in the acquisition of brain slices, statistical artifacts from head motion, and noise from adjacent brain regions, respectively (Smith et al., 2004). I also adjusted for temporal autocorrelation (Woolrich, Ripley, Brady, & Smith, 2001) using FSL's prewhitening algorithm. Finally, I registered the functional images to the T1-weighted anatomical image, and then registered the anatomical image to a standardized space (2mm MNI atlas) using FSL's FLIRT.

X-System Activation and the Self-Focused Condition. In order to acquire a measure of brain activity in the amygdala and ventral striatum, participants were exposed to a *self-focused condition* (see Figure 2 for example stimuli). Specifically, participants will be provided with the following instructions:

> Before continuing, we would first like you to imagine that you will spend all $100 on yourself. Furthermore, imagine how you would spend this $100 on yourself. Please use the next 60 seconds to imagine how you would spend this money on

yourself." Participants were then asked to do the following: "Continue to imagine that you will spend all $100 on yourself. Below you will see a number of images. Please select the five images that best represent how you would spend this $100 on yourself." The self-focused condition is intended to stimulate brain activity in the X-System across all participants.

C-System Activation and the Other-Focused Condition. In order to obtain a measure of brain activity in the dorsomedial prefrontal cortex, participants were exposed to an *other-focused condition* (see Figure 3 for example stimuli). For the other-focused condition, participants were provided the following instructions:

> Before we continue to the final section, we would first like you to imagine that you will spend all $100 on someone else. Furthermore, imagine how you would spend this $100 on someone else. Please use the next 60 seconds to imagine how you would spend this money on someone else." Participants were then asked to do the following: "Continue to imagine that you will spend all $100 on someone else. Below you will see a number of images. Please select the five images that best represent how you would spend this $100 on someone else." The other-focused condition is intended to stimulate brain activity in the C-System across all participants.

Behavioral Measures

Below I list and discuss the two dependent variables used in my study. The first dependent variable – behavioral greed – was tested in the formal model (shown in Figure 1). The second dependent variable – change in behavioral greed – was tested in the exploratory part of the study.

Behavioral Greed. Consistent with previous experimental research assessing greedy behavior (Wang et al., 2011), behavioral greed was measured using an allocation task whereby participants were given $100 to distribute between themselves and a charity (chosen from a list of five charities). In order to reduce potential biases in decisions to participate in the fMRI portion of the study, participants were not informed a priori of the opportunity to earn $100. While in the scanner, participants were asked to decide how they will distribute the $100 between themselves and a charity. Participants were provided the following instructions:

> We are providing you with $100 to allocate between yourself and a humanitarian charity. You are given full discretion regarding how you will allocate the money between yourself and the charity that you chose. You may, for instance, keep all $100, give all $100 away, or allocate any amount in between that you wish. After you make your decision whatever amount you decided to retain for yourself will be given to you before you leave today. Any information regarding your decision will remain strictly confidential.

Participants were asked to complete this task again at the end of the study in order to calculate the change in behavioral greed below.

Change in Behavioral Greed. In order to test whether activation of the dorsomedial prefrontal cortex positively relates to a change in behavioral greed, I calculated a simple change score, subtracting participant's allocation decision at Time 1 (i.e., how much the participant kept in the first decision) from their allocation decision at Time 2 (i.e., how much the participant kept in the second decision). Higher scores indicate decreased greed (i.e., individuals decide to keep less on the reevaluation decision from their first decision). Although previous research has questioned the use of change scores as it can produce low reliability (Cronbach & Furby, 1970), research has since demonstrated that such a technique can be meaningfully applied under certain circumstances (Collins, 1996; Williams & Zimmerman, 1996). In particular, research suggests that change scores can be appropriately adopted when "the design is likely to produce appreciable change and the measures are sensitive to change" (Bolger & Amarel, 2007: 462).

Analytic Strategy

fMRI Analysis. I first conducted first-level analyses for each participant across both conditions (i.e, *self-focused* and *other-focused*) using a general linear model (GLM) with separate regressors for X-System activation and C-System activation, which yielded statistical maps for each functional scan. Onset times for X-System activation coincided with the onset times of the self-focused task, which prompted the participant to select the image that best represents how they would spend all $100 on *themselves*, and onset times for C-System activation coincided with the onset of the other-focused task, which prompted the participant to select the image that best represents how they would spend all $100 on *someone* else. In addition to the above, I also included the following regressors in the analysis for both runs: (1) imagining how to spend the $100, (2) selecting the preferred image, (3) reading the instructions for the subsequent allocation decision, (4) the allocation decision, (5) rest, (6) imagining how to spend the $100 > rest, (7) selecting the preferred image > rest, (8) reading the instructions for the subsequent allocation decision > rest, (9) and the allocation decision > rest. The above conditions for each participant were then combined into a higher-level analysis using FMRIB's Local Analysis of Mixed Effects (FLAME1) in order to examine group-level effects. Specifically, I constructed the following contrasts for both the self-focused and other-focused conditions (high greed > low greed) and (low greed > high greed), which were convolved with a canonical hemodynamic response modeled using a gamma function. I also included motion-correction parameters as covariates to help remove any remaining residual motion effects (Bullmore et al., 1999).

To examine the relationship between dispositional greed and brain activity in response to the self-focused and other-focused conditions, I performed a whole-brain analysis which tested the statistical significance of contrast 2 (i.e., high greed > low greed; low greed > high greed), listed above. Activation thresholding was carried out using FSL's cluster thresholding algorithm ($Z > 2.3$; cluster probability: $p. < .05$), which relies on Gaussian Random Field Theory to control for whole-brain multiple comparisons error.

In addition to the group-level whole-brain analysis I also performed a region of interest (ROI) analysis to obtain the mean signal intensity for each hypothesized region within the X-System and C-System at the subthreshold level. Specifically, I restricted activation search to the three areas previously discussed as commonly activated in emotion and reward expectation (i.e., amygdala and ventral striatum) and empathy and perspective taking (dMPFC). Region of interests were defined from the dataset using Mango. I acquired spherical masks (5mm) for each ROI. For the amygdala, I constructed masks of the left and right amygdala, for the ventral striatum, I constructed masks of the left and right nucleus accumbens, and for the dMPFC, I constructed masks for the left and right medial frontal gyrus.

Regression and Indirect Effects Analysis. The formal model in my study (Hypotheses 1, 2, and 3) sought to understand the impact of dispositional greed on behavioral greed via activation of the amygdala and ventral striatum. In addition to the whole brain analysis described above, which will test the potential differences in brain activity across the high-greed and low greed groups, I sought to further test direct and indirect effects among the variables in the formal model. As such, I dichotomized dispositional greed (1 = high-greed; 2 = low-greed), and entered it, along with reward responsiveness (control), the mean percentage signal change within the amygdala, putamen, nucleus accumbens, and behavioral greed into SPSS using the PROCESS Macro (Hayes, 2013). This bootstrapping approach is recommended as it has greater statistical power and better addresses limitations of non-normality and small samples sizes than other mediation techniques such as the Sobel (1982) test and the Baron and Kenny (1986) approach. Using this procedure, I tested two mediation models: the first with each hypothesized region in the left and right hemisphere (left amygdala, right amygdala, left NA, and right NA) as separate mediators, and the second with the left and right amygdala regions combined (i.e., overall amygdala activation) and the left and right nucleus accumbens combined (i.e. overall ventral striatum activation). This was done to test potential mediating effects of *specific hemispheric* differences, as well as *total* amygdala and ventral striatum activation. I used the following formula to compute the composite measure of overall amygdala activation and overall ventral striatum activation, respectively: Left_Amygdala X .50 + Right_Amygdala X .50; Left_NA X .50 + Right_NA X .50. Larson, et al., (2013) adopted a similar approach, where they analyzed two separate mediation models to test the influence of psychopathy on amygdala activation through prefrontal regions, with the first using activity in the inferior frontal gyrus, superior frontal gyrus, and medial frontal gyrus as separate mediators to test specific regional differences, and a second using a combination of these three regions (considered as the lateral prefrontal cortex) as a single mediator to test the overall impact of these regions.

Data Analyses for the Exploratory Study. The exploratory portion of the study (i.e., Research Questions 1 and 2) sought to address whether dMPFC activation predicted a change in behavioral greed, and whether this effect differs based on participants' dispositional greed. This portion of the study was tested using hierarchical multiple regression analysis. The interaction of dispositional greed (as a categorical variable coded 1 and 2) and dMPFC was tested using a method outlined by Aiken and West (1991). For a measure of dMPFC activation, I extracted the mean percentage signal change within the left and right medial frontal gyrus, and created a composite measure using the following formula: Left_MedFrontalGyrus X .50 + Right_MedFrontalGyrus X .50; I then tested its correlations with the difference between participants' allocation decisions at Time 1 and their allocation decisions at Time 2 (i.e., change in behavior greed). To control for possible confounding influences, I included participant reward responsiveness scores in step 1 for both Research Questions tested with moderated regression analysis. Step 2 involved entering the main effect of the exploratory study variables (i.e., the relationship between dMPFC activation and change in behavioral greed) while step 3 involved entering the interaction of dispositional greed and dMPFC activation.

Chapter 5

Results

Results of Formal Model

Hypothesis 1 proposed that dispositional greed would be positively related to behavioral greed. More specifically, I predicted that high-greed participants would keep more in an allocation experiment compared to their low-greed counterparts. Table 1 and 2 reports means, standard deviations, and intercorrelations of variables used in the formal model, and Table 3 reports the results of an ANCOVA. The results indicate that, although dispositionally greedy participants, on average, kept more money in the allocation task (*m* = \$45.22, SD = \$36.60) compared to their non-greedy counterparts (*m* = \$21.70, SD = \$24.40), this difference was nonsignificant after controlling for reward responsiveness $F(1, 16) = 0.67$, p .43, $n^2 = .04$. Thus, Hypothesis 1 was not supported.

Hypothesis 2 proposed that dispositional greed will be positively associated with amygdala and ventral striatum activation during the self-focused condition. The results of the whole-brain analysis did not provide evidence of significant brain differences across the high-greed and low-greed groups. Thus, Hypothesis 2 was not supported. However, there was activation in the hypothesized regions at the sub-threshold level. To explore these regions, I conducted an ROI analysis to further examine potential differences across the groups, as well as to explore direct and indirect effects among study variables. Results of direct and indirect effects can be found in Tables 4 and 5 and Figures 5 and 6. As the results of the first mediation model (shown in Figure 5) indicate, no significant differences were found between those high and low on dispositional greed for left amygdala activation (β = .97, p = .06, *n.s.*), right amygdala activation (β = .42, p = .41, *n.s*), left NA activation (β = -.72, p =.17, *n.s*), and right NA activation (β = -.53, p = .31, *n.s*). The results of the second mediation model (shown in Figures 6 and 7), which examined the influence of dispositional greed on overall amygdala and ventral striatum activation, indicate that although dispositional greed was not positively associated with overall ventral striatum activation(β = -.64, p = .21, *n.s.*), it was positively associated with overall amygdala activation (β = 1.20, *p* = .01) with high-greed participants experiencing significantly more overall amygdala activation (*m* = 8707.19, SD = 358.10) than their low-greed counterparts (*m* = 8188.03, SD = 443.08).

Hypothesis 3 proposed that activation of the amygdala and ventral striatum would have a positive effect on behavioral greed. As the results of the first mediation model indicate, no significant differences were found between left amygdala activation (β = -.007, p = .50, *n.s.*), right amygdala activation (β = -.007, p = .60, *n.s*), left NA activation (β = .002, p =.79, *n.s*), and right NA activation (β = -.005, p = .40, *n.s*), on behavioral greed. Further, the results of the second mediation model, which examined the influence of overall amygdala and ventral striatum activation on behavioral greed, indicate that no significant differences were found between overall amygdala activation (β = -.017, p = .38, *n.s.*), and overall NA activation (β = -.004, p = .27, *n.s*), on behavioral greed. Thus, Hypothesis 3 was not supported.

Finally, Hypothesis 4 proposed that activation of the amygdala and ventral striatum would mediate the relationship between dispositional greed and behavioral greed. I tested this hypothesis using the bootstrapping procedure described by Preacher and Hayes (2004). As shown in Table 4 and 5, neither mediation models showed significant mediation. Specifically, for the first mediation model, the results indicate that the indirect effect of dispositional greed on behavioral greed via left amygdala activation (-6.270, 95% CI [-58.040, 12.240]), right amygdala activation (-2.014, 95% CI [-37.635, 6.795]), left NA activation (-2.972, 95% CI [-53.107, 31.782]), and right NA activation (-6.743, 95% CI [-9.400, 69.755]), were nonsignificant, as each confidence interval contained zero. Further, for the second mediation model, the results indicate that the indirect effect of dispositional greed on behavioral greed via overall amygdala activation (-9.447, 95% CI [-62.356, 11.676]), and overall NA activation (5.639, 95% CI [-2.425, 20.823]) were nonsignificant, as each confidence interval contained zero. Finally, examination of the pairwise contrasts across both models indicates no significant differences in magnitude for any of the indirect effects. Thus, Hypothesis 4 was not supported.

Results of Exploratory Study

The exploratory portion of this study tested whether greater activation of the dMPFC was associated with a greater change in behavior greed, and whether greed would moderate this relationship. Means, standard deviations, and intercorrelations of variables are reported in Table 7. I used hierarchical regression analysis following the Aiken and West (1991) approach to testing moderation. First, shown in Model 1, I entered the control variable, reward responsiveness. Next, in shown Model 2, I entered reward responsiveness followed by the independent variables, dispositional greed and medial frontal gyrus. Finally, shown in Model 3, I entered all control and independent variables followed by the interaction term, medial frontal gyrus X dispositional greed. As shown in Table 6 and 7, the results indicate that increases in dMPFC activation were not significantly associated with changes in behavioral greed ($\beta = -0.36$, $p = 0.14$), nor did dispositional greed have a significant moderation effect on this relationship ($\beta = 1.74$, $p = .54$).

Table 1

Means, Standard Deviations, and Intercorrelations of Variables Examining Specific Hemispheric Amygdala and Ventral Striatum regions

	Variable	Mean	SD	1	2	3	4	5	6	7
1	Reward responsiveness	4.35	.51	-	.40	-.11	.29	.15	.23	.55*
2	Dispositional greed	1.47	.51	.40	-	.38	.30	-.25	-.13	.37
3	Left Amygdala	8246.96	886.62	-.11	.38	-	-.28	-.32	-.26	-.06
4	Right Amygdala	8620.93	668.56	.29	.30	-.28	-	-.25	-.15	.17
5	Left NA	8956.01	2460.95	.15	-.25	-.32	-.25	-	.87*	-.10
6	Right NA	8546.18	2437.96	.23	-.13	-.26	-.15	87*	-	-.12
7	Behavioral Greed	32.84	32.23	.55*	.37	-.06	.17	-.10	-.12	-

N = 19

* $p = < 0.05$

Table 2

Means, Standard Deviations, and Intercorrelations of Variables for Mediation Model Examining Overall Amygdala and Ventral Striatum Regions

	Variable	Mean	SD	1	2	3	4	5
1	Reward responsiveness	4.35	.51	-	.40	.12	.20	.55*
2	Dispositional greed	1.47	.51	.40	-	.56*	-.20	.37
3	Overall Amygdala	8433.95	475.48	.12	.56*	-	-.42	.06
4	Overall NA	8751.09	2367.67	.20	-.20	-.42	-	-.11
5	Behavioral Greed	32.84	32.23	.55*	.37	.06	-.11	-

N = 19

* $p = < 0.05$

Table 3

ANCOVA Results and Descriptive Statistics for Behavioral Greed by Level of Dispositional Greed

	Behavioral Greed at Time 1				Behavioral Greed at Time 2			
	Observed Mean	Adjusted Mean	SD	n	Observed Mean	Adjusted Mean	SD	n
High-Greed	\$45.22	varies	\$36.60	9	\$44.44	varies	\$36.18	9
Low Greed	\$21.70	varies	\$24.40	10	\$20.80	varies	\$25.69	10

Source	SS	df	MS	F	SS	df	MS	F
DGS	521.89	1	521.89	.67	422.11	1	422.11	.563
Control	3617.54	1	3617.54	.05*	4422.45	1	4422.45	.027*
Error	12456.11	16	77851		11987.37	16	745.21	

Note. R^2 = .33, Adj. R^2 = .25.

* $p < .05$

Table 4

Mediation of the Indirect Effects of Dispositional Greed on Behavioral Greed via Specific Hemispheric Amygdala and Ventral Striatum Regions

				Bootstrapping Percentile 95% CI	
	Point Estimate	*SE*	*Z*	Lower	Upper
		Indirect Effects			
L_Amy	-6.2703	16.1440	-.5988	-58.0402	12.2400
R_Amy	-2.0144	8.9878	-.3197	-37.6350	6.7950
L_NA	-2.9718	20.1756	-.2180	-53.1070	31.7816
R_NA	6.7428	16.7734	.5400	-9.3995	69.7552
TOTAL	-4.5137	19.2409	-.2346	-45.6448	26.9460
L_Amy vs. R_Amy	-4.2559	17.1397	-.2483	-50.1838	20.0146
L_Amy vs. L_NA	-3.2985	28.2811	-.1166	-72.2837	43.3352
L_Amy vs. R_NA	-13.0131	22.7202	-.5728	-71.5763	18.0217
R_Amy vs. L_NA	.9575	24.1950	.0396	-61.0746	43.3894
R_Amy vs. R_NA	-8.7572	18.2305	-.4804	-71.3443	12.4335
L_NA vs. R_NA	-9.7146	34.9496	-.2780	-120.8215	33.0630

Note: Values shown are unstandardized, C_x = contrasts of indirect effects, SE = Standard Error, 5,000 bootstrap samples, * = p. < 0.05

Table 5

Mediation of the Indirect Effects of Dispositional Greed on Behavioral Greed via Overall Amygdala and Ventral Striatum Regions

				Bootstrapping Percentile 95% CI	
	Point Estimate	*SE*	*Z*	Lower	Upper
Overall Amygdala	-9.4468	16.4044	-.8117	-62.3556	11.6755
Overall NA	5.6394	7.4512	.7443	-2.4248	28.8225
TOTAL	-3.8074	14.1316	-.2694	-49.9746	13.9930
Amy vs. NA	-15.0863	21.2025	-.7115	-78.0379	13.7881

Note: Values shown are unstandardized, C_x = contrasts of indirect effects, SE = Standard Error, 5,000 bootstrap samples, * = p. < 0.05

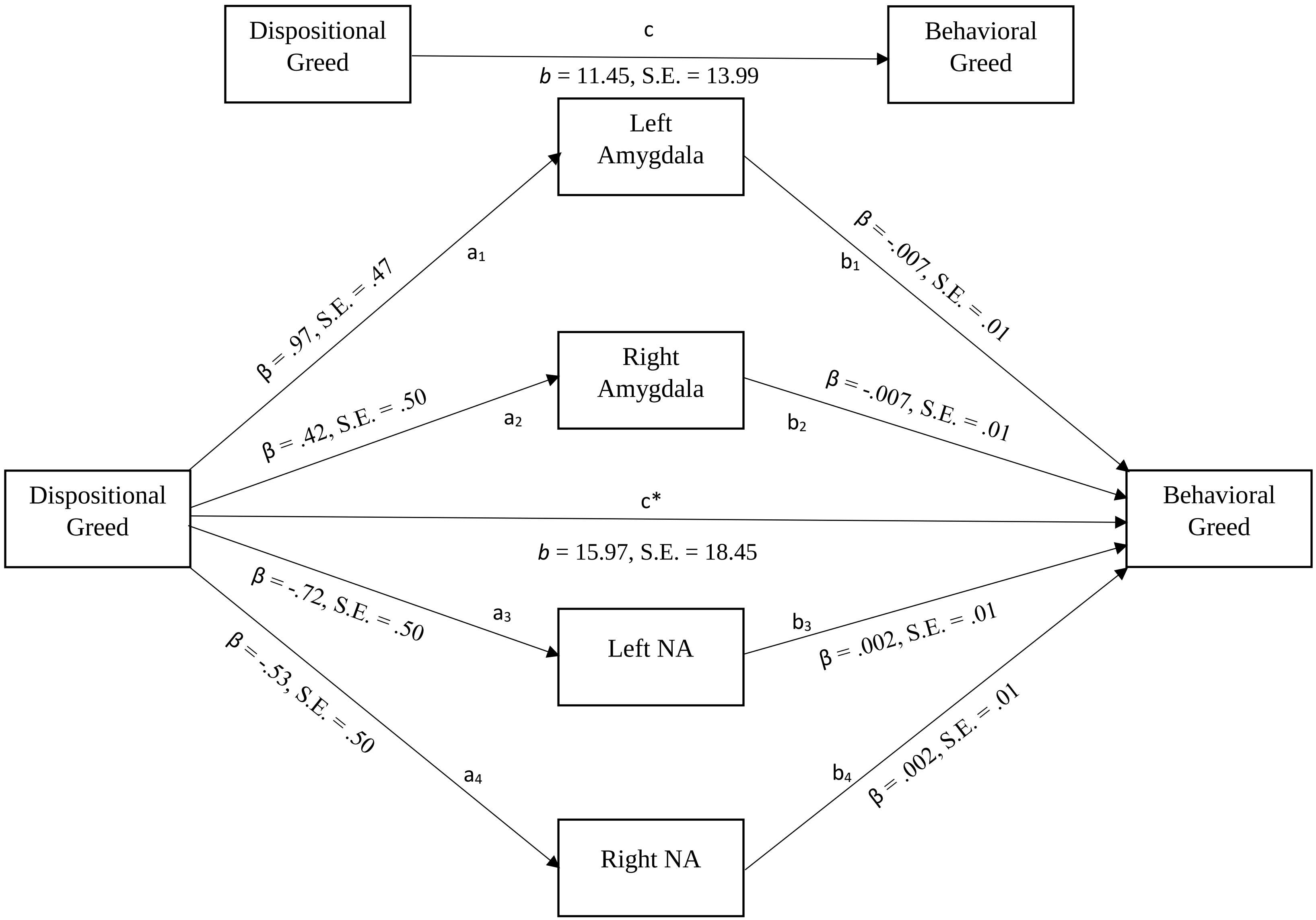


Figure 5. Multiple Mediation Analyses using Specific Hemispheric Amygdala and Ventral Striatum Regions

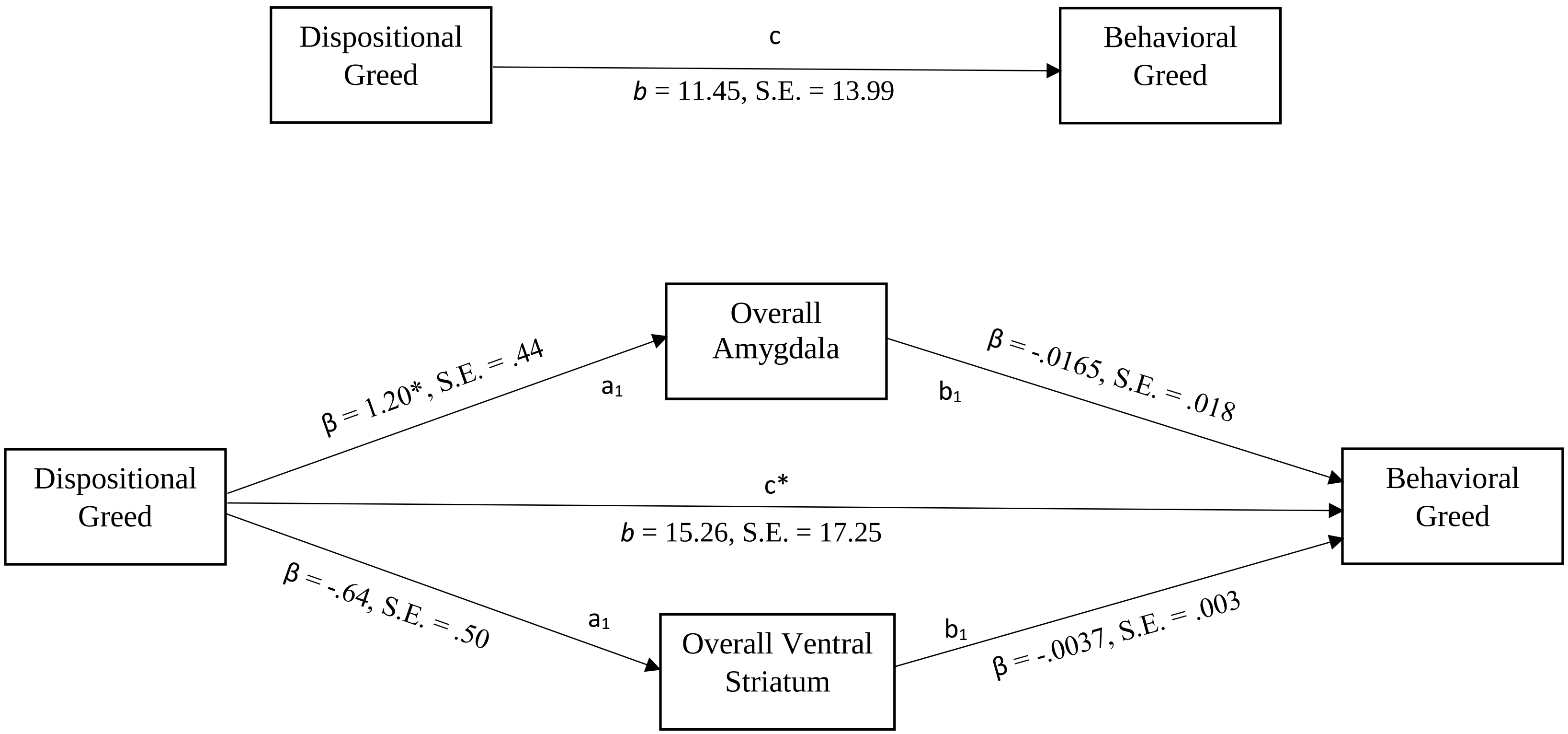


Figure 6. Multiple Mediation Analyses using Overall Amygdala and Ventral Striatum Regions

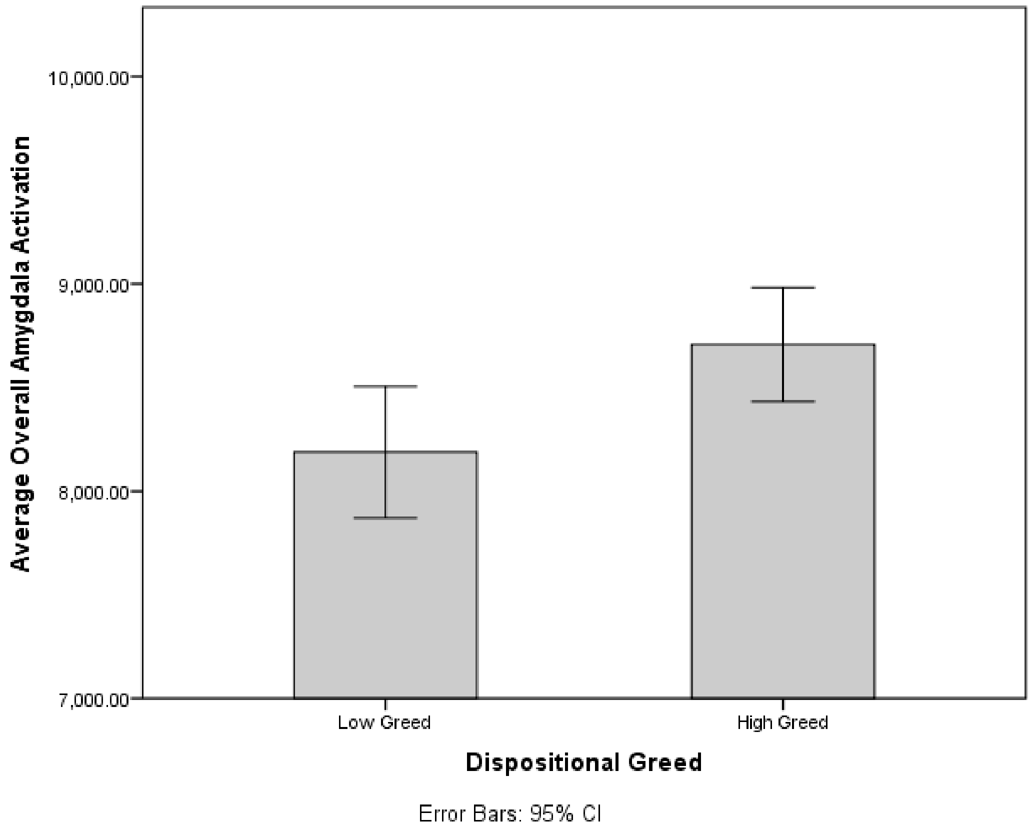


Figure 7. Average Amount of Overall Amygdala Activation Across High and Low Dispositional Greed

Table 6

Results of moderated regression analysis for change in behavioral greed

	Change in Behavioral Greed		
	Model 1	Model 2	Model 3
Control variables			
Reward responsiveness	0.37	.3	.26
Independent variables			
Medial frontal gyrus activation		-.36	-.82
Dispositional greed		-.13	-1.82
Moderator variables			
Medial frontal gyrus X dispositional greed			.74
R^2	.14	.27	.29
Adjusted R^2	.09	.13	.09
Change in R^2	.14	.14	.02
F change	2.70	1.4	.39

Values reported are standardized regression coefficients

Table 7

Means, standard deviations, and intercorrelations of exploratory study variables

	Variable	Mean	SD	1	2	3	4
1	Reward responsiveness	4.35	.51	-	-.33	.40	.37
2	Medial frontal gyrus	10322.29	1153.45	-.33	-	-.07	-.45
3	Dispositional greed	1.47	.51	.40	-.07	-	.02
4	Change in behavioral greed	-.84	3.78	.37	-.45	.02	-

N = 19

* *p* = < 0.05

Chapter 6

Discussion

The primary purpose of the current study was to understand why and how individual differences in greed motivate decidedly greedy behaviors. Different from my prediction, the results of this study did not support the assertion that those high (versus low) on dispositional greed would experience greater activation within brain areas associated with emotional arousal and reward expectation, specifically the amygdala and ventral striatum. Further, the results of the ROI analysis did not support the proposed mediating influence of these brain regions on the relationship between dispositional greed and greedy behavior. Finally, results of the exploratory study found no significant associations between brain regions associated with empathy and perspective taking of others, specifically the dorsomedial prefrontal cortex, and changes in behavioral greed. Below I discuss the limitations and potential contributions of this research.

Limitations and Future Research

Despite the novelty of my study and its potential theoretical implications, it is not without limitations. Arguably the greatest limitation of the current study concerns the potential power issues inherent to its small sample size. Because of the difficulty detecting neurological differences (Button et al., 2013), mediation effects (Fritz & MacKinnon, 2007), and moderation effects (Aguinis, Beaty, Boik, & Pierce, 2005), a larger sample might have allowed for the detection of the hypothesized relationships. Future research would benefit from an examination of the proposed effects using a larger sample size. In addition, although prior research has relied predominantly on allocation experiments to assess greedy behavior (Wang et al., 2011), it remains difficult, if not impossible, to determine whether such measures are actually capturing greed and not something else (e.g., legitimate self-interest, need, etc.). However, I attempted to address this limitation by offering a larger than normal monetary reward. Although the debate regarding the threshold between self-interest and greed is not entirely settled (Wang & Murnighan, 2011), recent research suggests that such differences can be identified (Haynes, et al., 2014), which summons future research to continue to refine current measures for greedy behavior. A further limitation concerns the design used for the current study. Although every attempt was made to ensure that participants understood the tasks they were performing, particularly their opportunity to receive $100, two participants later reported that they thought the $100 was hypothetical. This may have affected some of the participants' decisions on the allocation experiment.

Additionally, due to concerns with power inherent to my sample size, I used an exclusively male sample. Although this allowed me to control for a well-known predictor to greed behavior (Wang et al., 2011), the generalizability of my findings is limited. Because gender is a known predictor of greedy behavior, an interesting area for future research would be to examine whether gender interacts with greed to predict neural activation. Further, my use of a student sample further limits the generalizability of the current study. In particular, my use of fulltime university students raises the concern that participants' decisions may be influenced by need, rather than greed, as fulltime students are likely to have limited disposable income. I attempted to account for this during the self-focused condition by primarily presenting images of discretionary items (i.e., fashion accessories, video games, etc.). Although the adoption of brain imaging technology make the use of a student sample practical, future research would benefit from an examination of such effects across a sample less likely to be sensitive to financial need, such as an employee sample. Additionally, although my use of highly appetitive images to activate brain regions associated with reward are consistent with prior literature (Gable & Harmon-Jones, 2010), in order to generalize these findings to the workplace, future research may also wish to identify and adopt stimuli more relevant to the organizational context. For example, the current study used images of people in need to stimulate activation of the C-System, future research using an employee sample might consider using their organization's Code of Ethics to condition participants to consider the consequences of their actions.

A final limitation of this study is that I only examined behavioral greed as an outcome of dispositional greed and neural reactivity, and this outcome was only measured using an allocation experiment. Future research would benefit from an examination of a broader set behaviors theoretically linked with dispositional greed such as risk-taking (Mussel et al., 2015), unethical behavior, or even certain citizenship behaviors that are prosocial in nature (e.g., helping). Further, research may also wish to consider alternative ways to measure greedy behavior beyond allocation experiments. Mussel and Hewig (2016), for example, incorporated an array of measures intended to capture greedy behavior that extend beyond traditional allocation experiments, such as the use of self-reported investment decisions, and (f) annual income goals. Incorporating such proxies into future research may provide greater generalizability to the workplace.

Implications for Research

Despite the lack of support for the proposed relationships, I believe the results of the present study can inform future research on greed. First, this study sought to contribute to research on greed by theorizing and empirically testing the biological processes through which dispositional greed influences greedy behavior. Specifically, I suggested that dispositional greed results in a heightened sensitivity to potential reward – as measured by increased activity in the reward-center of the brain (i.e., amygdala and ventral striatum) –, which further motivates greedy behavior. Although prior research suggests that greedy behavior is a result of nonconscious emotional processes (Wang & Murnighan, 2011), my study is the first to empirically explore this relationship, as well as the potential for individual differences in greed to impact such processes. Given recent research demonstrating the negative impact geed can have on organizations (Haynes et al., 2014), as well as its effects on society in general (Armenakis & Lang, 2014), it is my hope that future research continues to explore greed and the biological mechanisms through which such effects occur.

Second, this study sought to extend the nomological network of greed by exploring potential neurological differences in dispositional greed, as well as contribute to extant research examining the neural correlates of personality and emotional processing (Canli, 2004; Canli et al., 2001). I focused particularly on the amygdala and ventral striatum as two important brain regions that co-vary based on participants' dispositional greed, as these regions comprise brain areas associated with emotion and the reward (Haber, 2011). Although my hypotheses were not supported, I believe the results of this study may hold practical significance (discussed further below) that should motivate future research to continue to explore the biological mechanisms that differentiate the greedy from the non-greedy.

Finally, this study sought to contribute to research on greed and ethical decision-making by demonstrating the potential for brain areas associated with empathy and perspective taking to override prior greedy decisions. The greater exposure and access to resources individuals are often confronted with at work, coupled with the frequency of high-profile corporate scandals involving just a few individuals within the organizational hierarchy, beckons organizational researchers to understand how individuals can override motivations to pursue their own interests at the cost of others. Prior research has acknowledged the importance of the C-System (Reynolds, 2006; Wang & Murnighan, 2011), particularly the prefrontal cortex (Baumgartner, Knoch, Hotz, Eisenegger, & Fehr, 2011; Knoch et al., 2008; Tabibnia et al., 2008), in overriding self-interested behavior. The present study explored whether activity in the dMPFC could motivate individuals to override their prior decisions, thus keeping less on a subsequent allocation decision. In addition, this study explored the potential for dispositional greed to moderate this effect. The results of my study, however, did not find support for these relationships. Despite the lack of findings, I encourage future researchers to continue to explore these effects and their potential impact on greedy behavior.

Although the present study was unable to find statistical significance for the proposed hypotheses, I believe some of the findings may provide practical significance, and are thus worth mentioning. First, despite not finding significant differences between those high and low on dispositional greed in predicting greedy behavior, my results clearly indicate a trend in giving/taking behavior across the two groups. Indeed, for the first allocation decision, the high-greed group kept on average $45.22 versus $21.70 for their low-greed counterparts. Similarly, for the reevaluation decision, participants in the high-greed group kept $44.44 versus $20.80 for their low-greed counterparts. It is reasonable to assume that with a larger sample size, such differences might have approached significance.

In addition, although the results of the whole-brain voxel-wise analysis showed no significant brain differences between those high and low on dispositional greed, results of an ROI analysis indicate that dispositional greed was significantly associated with sub-threshold activation in the amygdala. Specifically, my study did find dispositional greed to be significantly associated with an aggregated measure of amygdala activation when viewing highly appetitive stimuli. Further, although the relationships between dispositional greed and left and right amygdala activation were not significant at the .05 level, it is worth pointing out that the direction of these relationships were as hypothesized and, at least for the relationship between dispositional greed and left amygdala activation, the alpha approached significance ($p = .056$). These findings suggest that the physiological reactions to a potential monetary reward may be different for dispositionally greedy individuals compared to their nongreedy counterparts, and, once again underscore a trend that may reach statistical significance with the use of a larger sample size.

Finally, although my exploratory study did not find significant relationships between dMPFC activation and changes in behavioral greed, there are a couple of points of practical significance worth noting. First, although statistically insignificant, participants did keep on average less money in the reevaluation than the first allocation task ($32.00 versus $32.84). Second, while also statistically insignificant, the positive differences between individual's reevaluation decision from their first allocation decision was greater, on average, for low-greed individuals ($0.90) than for high-greed individuals ($0.78). It may be the case that a stronger manipulation was needed to activate the dMPFC and thus significantly effect participants' reevaluation. I urge future researchers to adapt and improve the design used here and continue to explore the regulatory potential of the C-System on X-System activation in the context of dispositional greed.

Conclusion

The primary objectives of this dissertation were to examine the potential cognitive and emotional process underlying greedy decision-making. Despite a lack of support for the current study, which explored the potential for brain activity in the amygdala and ventral striatum to mediate the relationship between dispositional greed and greedy behavior, results of a supplemental ROI analysis indicate that individual differences in greed may be related to activation in areas of the brain responsible for emotion (i.e., amygdala). I hope my study encourages future researchers to continue to explore the potential neurocognitive implications of greed and the potential for brain processes responsible for emotional arousal to play an important role in both the experience of dispositional greed as well as the motivation to engage in decidedly greedy behavior.

References

Aguinis, H., Beaty, J. C., Boik, R. J., & Pierce, C. A. 2005. Effect size and power in assessing moderating effects of categorical variables using multiple regression: a 30-year review.

Aiken, L. S., West, S. G., & Reno, R. R. 1991. *Multiple regression: Testing and interpreting interactions*. Sage.

Ajzen, I., & Fishbein, M. 1977. Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5): 888.

Aquino, K., Lewis, M. U., & Bradfield, M. 1999. Justice constructs, negative affectivity, and employee deviance: A proposed model and empirical test. *Journal of Organizational Behavior*, *20*(7), 1073-1091.

Armenakis, A., & Lang, I. 2014. Forensic diagnosis and transformation of an organizational culture. *Journal of Change Management*, *14*(2), 149-170.

Baron, R. M., & Kenny, D. A. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173.

Bagozzi, R. P., Verbeke, W. J., Dietvorst, R. C., Belschak, F. D., van den Berg, W. E., & Rietdijk, W. J. 2013. Theory of mind and empathic explanations of Machiavellianism a neuroscience perspective. *Journal of Management*, *39*(7), 1760-1798.

Balot, R. K. 2001. *Greed and injustice in classical Athens*. Princeton University Press.

Baumgartner, T., Knoch, D., Hotz, P., Eisenegger, C., & Fehr, E. 2011. Dorsolateral and ventromedial prefrontal cortex orchestrate normative choice. *Nature Neuroscience*, *14*(11), 1468-1474.

Bazerman, M. H., & Chugh, D. 2006. Decisions without blinders. *Harvard Business Review*, *84*(1), 88.

Bechara, A. 2005. Decision making, impulse control and loss of willpower to resist drugs: a neurocognitive perspective. *Nature Neuroscience*, *8*(11), 1458-1463.

Bechara, A., & Damasio, A. R. 2005. The somatic marker hypothesis: A neural theory of economic decision. *Games and Economic Behavior*, *52*(2), 336-372.

Becker, W. J., & Cropanzano, R. (2010). Organizational neuroscience: The promise and prospects of an emerging discipline. *Journal of Organizational Behavior, 31*(7), 1055-1059.

Becker, W. J., Cropanzano, R., & Sanfey, A. G. 2011. Organizational neuroscience: Taking organizational theory inside the neural black box. *Journal of Management*, 0149206311398955.

Berdal, M. R., & Malone, D. 2000. *Greed & grievance: Economic agendas in civil wars*. Lynne Rienner Publishers.

Bolger, N., & Amarel, D. 2007. Effects of social support visibility on adjustment to stress: experimental evidence. *Journal of Personality and Social Psychology*, *92*(3), 458.

Brosch, T., Coppin, G., Scherer, K. R., Schwartz, S., & Sander, D. 2011. Generating value (s): Psychological value hierarchies reflect context-dependent sensitivity of the reward system. *Social Neuroscience*, *6*(2), 198-208.

Brown, S. M., Manuck, S. B., Flory, J. D., & Hariri, A. R. 2006. Neural basis of individual differences in impulsivity: contributions of corticolimbic circuits for behavioral arousal and control. *Emotion*, *6*(2), 239.

Bullmore, E. T., Brammer, M. J., Rabe‐Hesketh, S., Curtis, V. A., Morris, R. G., Williams, S. C. R., ... & McGuire, P. K. 1999. Methods for diagnosis and treatment of stimulus‐correlated motion in generic brain activation studies using fMRI. *Human Brain Mapping*, *7*(1), 38-48.

Button, K. S., Ioannidis, J. P., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S., & Munafò, M. R. 2013. Power failure: why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*(5), 365-376.

Canli, T. 2004. Functional brain mapping of extraversion and neuroticism: learning from individual differences in emotion processing. *Journal of Personality*, *72*(6), 1105-1132.

Canli, T., Zhao, Z., Desmond, J. E., Kang, E., Gross, J., & Gabrieli, J. D. 2001. An fMRI study of personality influences on brain reactivity to emotional stimuli. *Behavioral Neuroscience*, *115*(1), 33.

Carnevale, J. B., & Walker, A. G. (2014, January). Greed at Work: A Review and Assessment. In *Academy of Management Proceedings* (Vol. 2014, No. 1, p. 12574). Academy of Management.

Carnevale, J. B., Walker, A. G., & Walker, H. J. (2016, January). Organizational Greed: Behavior, Perception, or Trait? Toward an Integrated Theory. In *Academy of Management Proceedings* (Vol. 2016, No. 1, p. 11480). Academy of Management.

Cardinal, R. N., Parkinson, J. A., Hall, J., & Everitt, B. J. 2002. Emotion and motivation: the role of the amygdala, ventral striatum, and prefrontal cortex. *Neuroscience & Biobehavioral Reviews*, *26*(3), 321-352.

Carver, C. S., & White, T. L. 1994. Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*(2), 319.

Case, J. 2000. *Employee theft: The profit killer*. John Case & Associates.

Chaiken, S., & Trope, Y. (Eds.). 1999. *Dual-process theories in social psychology*. Guilford Press.

Coffin, B. 2003. Breaking the silence on white-collar crime. *Risk Management*, *50*(9), 8-9.

Collins, L. M. 1996. Is reliability obsolete? A commentary on" Are simple gain scores obsolete?" *Applied Psychological Measurement*, *20*(3), 289-292.

Connelly, S., Helton-Fauth, W., & Mumford, M. D. 2004. A managerial in-basket study of the impact of trait emotions on ethical choice. *Journal of Business Ethics*, *51*(3), 245-267.

Costa, P. T., & McCrae, R. R. 1980. Influence of extraversion and neuroticism on subjective well-being: happy and unhappy people. *Journal of Personality and Social Psychology*, *38*(4), 668.

Coughlan, R., & Connolly, T. 2008. Investigating unethical decisions at work: Justification and emotion in dilemma resolution. *Journal of Managerial Issues*, 348-365.

Cozzolino, P. J., Sheldon, K. M., Schachtman, T. R., & Meyers, L. S. 2009. Limited time perspective, values, and greed: Imagining a limited future reduces avarice in extrinsic people. *Journal of Research in Personality*, *43*(3), 399-408.

Cozzolino, P. J., Staples, A. D., Meyers, L. S., & Samboceti, J. 2004. Greed, death, and values: From terror management to transcendence management theory. *Personality and Social Psychology Bulletin*, *30*(3), 278-292.

Cronbach, L. J., & Furby, L. 1970. How we should measure" change": Or should we? *Psychological Bulletin*, *74*(1), 68.

Cunningham, W. A., & Brosch, T. 2012. Motivational salience amygdala tuning from traits, needs, values, and goals. *Current Directions in Psychological Science*, *21*(1), 54-59.

De Dreu, C. K., & Nauta, A. 2009. Self-interest and other-orientation in organizational behavior: implications for job performance, prosocial behavior, and personal initiative. *Journal of Applied Psychology*, *94*(4), 913.

DeCelles, K. A., DeRue, D. S., Margolis, J. D., & Ceranic, T. L. 2012. Does power corrupt or enable? When and why power facilitates self-interested behavior. *Journal of Applied Psychology*, *97*(3), 681.

Denny, B.T., Kober, H., Wager, T.D., Ochsner, K.N. 2012. A meta-analysis of functional neuroimaging studies of self- and other judgments reveals a spatial gradient for mentalizing in medial prefrontal cortex. *Journal of Cognitive Neuroscience*, 24(8), 1742–52.

Detert, J. R., Treviño, L. K., & Sweitzer, V. L. 2008. Moral disengagement in ethical decision making: a study of antecedents and outcomes. *Journal of Applied Psychology, 93*(2), 374.

Diekhof, E. K., Kaps, L., Falkai, P., & Gruber, O. 2012. The role of the human ventral striatum and the medial orbitofrontal cortex in the representation of reward magnitude–an activation likelihood estimation meta-analysis of neuroimaging studies of passive reward expectancy and outcome processing. *Neuropsychologia*, *50*(7), 1252-1266.

Direnzo, M. S., & Greenhaus, J. H. 2011. Job search and voluntary turnover in a boundaryless world: A control theory perspective. *Academy of Management Review*, 36(3): 567-589.

Dulebohn, J. H., Conlon, D. E., Sarinopoulos, I., Davison, R. B., & McNamara, G. 2009. The biological bases of unfairness: Neuroimaging evidence for the distinctiveness of procedural and distributive justice. *Organizational Behavior and Human Decision Processes*, *110*(2), 140-151.

Dulebohn, J. H., Davison, R. B., Lee, S. A., Conlon, D. E., McNamara, G., & Sarinopoulos, I. C. 2016. Gender differences in justice evaluations: Evidence from fMRI. *Journal of Applied Psychology*, *101*(2), 151.

Eckel, C. C., & Grossman, P. J. 1998. Are women less selfish than men?: Evidence from dictator experiments. *The Economic Journal*, *108*(448), 726-735.

Eek, D., & Biel, A. 2003. The interplay between greed, efficiency, and fairness in public-goods dilemmas. *Social Justice Research*, *16*(3), 195-215.

Elliott, R., Friston, K. J., & Dolan, R. J. 2000. Dissociable neural responses in human reward systems. *The Journal of Neuroscience*, *20*(16), 6159-6165.

Elsbach, K. D., & Kramer, R. M. 2003. Assessing creativity in Hollywood pitch meetings: Evidence for a dual-process model of creativity judgments. *Academy of Management Journal*, *46*(3), 283-301.

Evans, J. S. B. 2003. In two minds: dual-process accounts of reasoning. *Trends in Cognitive Sciences*, *7*(10), 454-459.

Fan, Y., Wonneberger, C., Enzi, B., De Greck, M., Ulrich, C., Tempelmann, C., Bogerts, B., Doering, S., & Northoff, G. 2011. The narcissistic self and its psychological and neural correlates: an exploratory fMRI study. *Psychological Medicine*, *41*(08), 1641-1650.

Filler, A. G. 2009. The history, development and impact of computed imaging in neurological diagnosis and neurosurgery: CT, MRI, and DTI. *Nature Proceedings*, *7*(1), 1-69.

Fritz, M. S., & MacKinnon, D. P. 2007. Required sample size to detect the mediated effect. *Psychological Science*, *18*(3), 233-239.

Furley, D. J. 2003. *From Aristotle to Augustine* (Vol. 2). Psychology Press.

Gable, P. A., & Harmon-Jones, E. 2008. Approach-motivated positive affect reduces breadth of attention. *Psychological Science*, *19*(5), 476-482.

George, M. S., Ketter, T. A., Parekh, P. I., Herscovitch, P., & Post, R. M. 1996. Gender differences in regional cerebral blood flow during transient self-induced sadness or happiness. *Biological Psychiatry*, *40*(9), 859-871.

Grant, A. M., & Mayer, D. M. 2009. Good soldiers and good actors: prosocial and impression management motives as interactive predictors of affiliative citizenship behaviors. *Journal of Applied Psychology, 94*(4), 900.

Gray, J. R., Burgess, G. C., Schaefer, A., Yarkoni, T., Larsen, R. J., & Braver, T. S. 2005. Affective personality differences in neural processing efficiency confirmed using fMRI. *Cognitive, Affective, & Behavioral Neuroscience*, *5*(2), 182-190.

Greenberg, J. 1982. Countering inequity with inequity: Over-rewarding generosity and under-rewarding greed. *European Journal of Social Psychology, 12*(2), 181-185.

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. 2001. An fMRI investigation of emotional engagement in moral judgment. *Science*, *293*(5537), 2105-2108.

Groves, P. M., & Thompson, R. F. 1970. Habituation: a dual-process theory. *Psychological Review, 77*(5), 419.

Haber, S. N. 2011. 11 Neuroanatomy of Reward: A View from the Ventral Striatum. *Neurobiology of Sensation and Reward*, 235.

Haidt, J. 2001. The emotional dog and its rational tail: a social intuitionist approach to moral judgment. *Psychological Review, 108*(4), 814.

Hamann, S. B., Ely, T. D., Hoffman, J. M., & Kilts, C. D. 2002. Ecstasy and agony: activation of the human amygdala in positive and negative emotion. *Psychological Science*, *13*(2), 135-141.

Hansen, L. L., & Movahedi, S. (2010, June). Wall Street Scandals: The Myth of Individual Greed1. In *Sociological Forum* (Vol. 25, No. 2, pp. 367-374). Blackwell Publishing Ltd.

Harmon-Jones, E., Gable, P. A., & Price, T. F. 2012. The influence of affective states varying in motivational intensity on cognitive scope. *Frontiers in Integrative Neuroscience*, 6, 73.

Hayes, A. F. 2013. PROCESS SPSS Macro [Computer software and manual].

Haynes, K. T., Campbell, J. T., & Hitt, M. A. 2014. When more is not enough executive greed and its influence on shareholder wealth. *Journal of Management*, 0149206314535444.

Haynes, K. T., Hitt, M. A., & Campbell, J. T. 2015. The Dark Side of Leadership: Towards a Mid-Range Theory of Hubris and Greed in Entrepreneurial Contexts. *Journal of Management Studies*, *52*(4), 479-505.

Haynes, K. T., Josefy, M., & Hitt, M. A. 2015. Tipping Point Managers' Self-Interest, Greed, and Altruism. *Journal of Leadership & Organizational Studies*, 1548051815585171.

Healey, M. P., & Hodgkinson, G. P. 2014. Rethinking the philosophical and theoretical foundations of organizational neuroscience: A critical realist alternative. *Human Relations,* 0018726714530014.

Hobbes, T., & Macpherson, C. B. 1968. *Leviathan; edited with an Introduction by CB Macpherson*. Penguin.

Hodgkinson, G. P., & Clarke, I. 2007. Conceptual note: Exploring the cognitive significance of organizational strategizing: A dual-process framework and research agenda. *Human Relations*, *60*(1), 243-255.

Hunt, S. D., & Vitell, S. 1986. A general theory of marketing ethics. *Journal of Macromarketing*, *6*(1), 5-16.

Iacoboni, M., Lieberman, M. D., Knowlton, B. J., Molnar-Szakacs, I., Moritz, M., Throop, C. J., & Fiske, A. P. 2004. Watching social interactions produces dorsomedial prefrontal and medial parietal BOLD fMRI signal increases compared to a resting baseline. *Neuroimage*, *21*(3), 1167-1173.

Insko, C. A., Schopler, J., Hoyle, R. H., Dardis, G. J., & Graetz, K. A. 1990. Individual-group discontinuity as a function of fear and greed. *Journal of Personality and Social Psychology*, *58*(1), 68.

Jazzard, P., Matthews, P. M., & Smith, S. M. (2003). Functional magnetic resonance imaging: An introduction to methods. Oxford University Press.

Jenkinson, M., Beckmann, C. F., Behrens, T. E., Woolrich, M. W., & Smith, S. M. 2012. Fsl. *Neuroimage*, *62*(2), 782-790.

Jin, H., & Zhou, X. Y. 2013. Greed, leverage, and potential losses: A prospect theory perspective. *Mathematical Finance*, *23*(1), 122-142.

Jonas, E., Sullivan, D., & Greenberg, J. 2013. Generosity, greed, norms, and death–Differential effects of mortality salience on charitable behavior. *Journal of Economic Psychology*, *35*, 47-57.

Jones, T. M. 1991. Ethical decision making by individuals in organizations: An issue-contingent model. *Academy of Management Review*, *16*(2), 366-395.

Kasser, T., & Sheldon, K. M. 2000. Of wealth and death: Materialism, mortality salience, and consumption behavior. *Psychological Science*, *11*(4), 348-351.

Kazemi, A., Eek, D., & Gärling, T. 2006. *The Interplay Between Greed Fairness and Group Goal in Allocation of Public Goods*. [Department of Psychology], Göteborg University.

Kish-Gephart, J. J., Harrison, D. A., & Treviño, L. K. 2010. Bad apples, bad cases, and bad barrels: meta-analytic evidence about sources of unethical decisions at work. *Journal of Applied Psychology*, *95*(1), 1.

Klüver, H., & Bucy, P. C. 1937. " Psychic blindness" and other symptoms following bilateral temporal lobectomy in Rhesus monkeys. *American Journal of Physiology*.

Knoch, D., Nitsche, M. A., Fischbacher, U., Eisenegger, C., Pascual-Leone, A., & Fehr, E. 2008. Studying the neurobiology of social interaction with transcranial direct current stimulation—the example of punishing unfairness. *Cerebral Cortex*, *18*(9), 1987-1990.

Knutson, B., & Greer, S. M. 2008. Anticipatory affect: neural correlates and consequences for choice. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, *363*(1511), 3771-3786.

Knutson, B., Wimmer, G. E., Kuhnen, C. M., & Winkielman, P. 2008. Nucleus accumbens activation mediates the influence of reward cues on financial risk taking. *NeuroReport*, *19*(5), 509-513.

Krekels, G., & Pandelaere, M. 2015. Dispositional greed. *Personality and Individual Differences*, *74*, 225-230.

Larsen, R. J. 2000. Toward a science of mood regulation. *Psychological Inquiry*, *11*(3), 129-141.

Larsen, R. J., Diener, E., & Emmons, R. A. 1986. Affect intensity and reactions to daily life events. *Journal of Personality and Social Psychology*, *51*(4), 803.

Larsen, R. J., & Ketelaar, T. 1991. Personality and susceptibility to positive and negative emotional states. *Journal of Personality and Social Psychology*, *61*(1), 132.

Larson, C. L., Baskin-Sommers, A. R., Stout, D. M., Balderston, N. L., Curtin, J. J., Schultz, D. H., ... & Newman, J. P. 2013. The interplay of attention and emotion: top-down attention modulates amygdala activation in psychopathy. *Cognitive, Affective, & Behavioral Neuroscience*, *13*(4), 757-770.

Lee, N., Senior, C., & Butler, M. J. 2012. The domain of organizational cognitive neuroscience theoretical and empirical challenges. *Journal of Management*, *38*(4), 921-931.

Lieberman, M. D. 2007. Social cognitive neuroscience: a review of core processes. *Annu. Rev. Psychol.*, *58*, 259-289.

Lieberman, M. D., Gaunt, R., Gilbert, D. T., & Trope, Y. 2002. Reflection and reflexion: A social cognitive neuroscience approach to attributional inference. *Advances in Experimental Social Psychology*, *34*, 199-249.

Lindebaum, D., & Zundel, M. 2013. Not quite a revolution: Scrutinizing organizational neuroscience in leadership studies. *Human Relations*, *66*(6), 857-877.

Lucas, R. E., & Baird, B. M. 2004. Extraversion and emotional reactivity. *Journal of Personality and Social Psychology*, *86*(3), 473.

Lutz, K., & Widmer, M. 2014. What can the monetary incentive delay task tell us about the neural processing of reward and punishment? *Neurosci. Neuroeconom*, *3*, 33-45.

Maccoby, M. 2000. Narcissistic leaders: The incredible pros, the inevitable cons. *Harvard Business Review, 78*, 68-78.

MacLean, P. D. 1990. *The triune brain in evolution: Role in paleocerebral functions*. Springer Science & Business Media.

Mantel, S. P. 2005. Choice or perception: How affect influences ethical choices among salespeople. *Journal of Personal Selling & Sales Management*, *25*(1), 43-55.

Mata, A., Ferreira, M. B., & Sherman, S. J. 2013. The metacognitive advantage of deliberative thinkers: A dual-process perspective on overconfidence. *Journal of Personality and Social Psychology, 105*(3), 353.

Matthews, C. 2012. Survey finds unethical business practices on the rise. *The Wall Street Journal.* Retrieved from: http://blogs.wsj.com/corruption-currents/2012/05/23/survey-finds-unethical-business-practices-on-the-rise/

Meglino, B. M., & Korsgaard, A. 2004. Considering rational self-interest as a disposition: organizational implications of other orientation. *Journal of Applied Psychology, 89*(6), 946.

Messick, D. M., & Bazerman, M. H. 1996. Ethical leadership and the psychology of decision-making. *MIT Sloan Management Review*, *37*(2), 9.

Metcalfe, J., & Mischel, W. 1999. A hot/cool-system analysis of delay of gratification: dynamics of willpower. *Psychological Review, 106*(1), 3.

Miller, D. T. 1999. The norm of self-interest. *American Psychologist, 54*(12), 1053.

Mitchell, J.P., Heatherton, T.F., Macrae, C.N. 2002. Distinct neural systems subserve person and object knowledge. *Proceedings of the National Academy of Sciences*, 99(23), 15238–43.

Mitchell, J.P., Macrae, C.N., Banaji, M.R. 2004. Encoding-specific effects of social cognition on the neural correlates of subsequent memory. *The Journal of Neuroscience*, 24(21), 4912–7.

Mitchell, J.P., Macrae, C.N., Banaji, M.R. 2006. Dissociable medial prefrontal contributions to judgments of similar and dissimilar others. *Neuron*, 50(4), 655–63.

Molenberghs, P., Prochilo, G., Steffens, N. K., Zacher, H., & Haslam, S. A. 2015. The Neuroscience of Inspirational Leadership: The Importance of Collective-Oriented Language and Shared Group Membership. *Journal of Management*, 0149206314565242.

Moore, D. A., & Loewenstein, G. 2004. Self-interest, automaticity, and the psychology of conflict of interest. *Social Justice Research*, *17*(2), 189-202.

Murray, E. A. 2007. The amygdala, reward and emotion. *Trends in Cognitive Sciences*, *11*(11), 489-497.

Mussel, P., & Hewig, J. 2016. The life and times of individuals scoring high and low on dispositional greed. *Journal of Research in Personality*, *64*, 52-60.

Mussel, P., Reiter, A. M., Osinsky, R., & Hewig, J. 2015. State-and trait-greed, its impact on risky decision-making and underlying neural mechanisms. *Social Neuroscience*, *10*(2), 126-134.

O'Doherty, J., Dayan, P., Schultz, J., Deichmann, R., Friston, K., & Dolan, R. J. 2004. Dissociable roles of ventral and dorsal striatum in instrumental conditioning. S*cience*, *304*(5669), 452-454.

O'Fallon, M. J., & Butterfield, K. D. 2005. A review of the empirical ethical decision-making literature: 1996–2003. *Journal of Business Ethics*, *59*(4), 375-413.

Ogawa, S., Lee, T. M., Nayak, A. S., & Glynn, P. 1990. Oxygenation-sensitive contrast in magnetic resonance image of rodent brain at high magnetic fields. *Magnetic Resonance in Medicine*, *14*(1), 68-78.

Phillips, M. L., Drevets, W. C., Rauch, S. L., & Lane, R. 2003. Neurobiology of emotion perception II: Implications for major psychiatric disorders. *Biological Psychiatry*, *54*(5), 515-528.

Powers, K. E., Chavez, R. S., & Heatherton, T. F. 2015. Individual differences in response of dorsomedial prefrontal cortex predict daily social behavior. *Social Cognitive and Affective Neuroscience*, nsv096.

Preacher, K. J., & Hayes, A. F. 2004. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods*, *36*(4), 717-731.

Preston, S. D., & De Waal, F. B. 2002. Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences*, *25*(1), 1-20.

Rand, D. G., Greene, J. D., & Nowak, M. A. 2012. Spontaneous giving and calculated greed. *Nature*, *489*(7416), 427-430.

Rest, J. 1979. Development in Judging Moral Issues (University of Minnesota Press, Minneapolis, MN).

Rest, J. 1986, Moral Development." Advances in Research and Theory (Praeger, New York, NY).

Reynolds, S. J. 2006. A neurocognitive model of the ethical decision-making process: implications for study and practice. *Journal of Applied Psychology*, *91*(4), 737.

Reynolds, S. J., & Ceranic, T. L. 2007. The effects of moral judgment and moral identity on moral behavior: an empirical examination of the moral individual. *Journal of Applied Psychology*, *92*(6), 1610.

Rosenthal, S. A., & Pittinsky, T. L. 2006. Narcissistic leadership. *The Leadership Quarterly*, *17*, 617-633.

Seo, M. G., Barrett, L. F., & Bartunek, J. M. 2004. The role of affective experience in work motivation. *Academy of Management Review*, *29*(3), 423-439.

Seo, M. G., & Barrett, L. F. 2007. Being emotional during decision making—good or bad? An empirical investigation. *Academy of Management Journal*, *50*(4), 923-940.

Seuntjens, T. G., Zeelenberg, M., & van de Ven, N. 2015. Defining greed. *British Journal of Psychology*, (106), 505-525.

Seuntjens, T. G., Zeelenberg, M., van de Ven, N., & Breugelmans, S. M. 2015. Dispositional greed. *Journal of Personality and Social Psychology*, *108*(6), 917.

Smith, E. R., & DeCoster, J. 2000. Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review*, *4*(2), 108-131.

Smith, S. M., Jenkinson, M., Woolrich, M. W., Beckmann, C. F., Behrens, T. E., Johansen-Berg, H., ... & Niazy, R. K. (2004). Advances in functional and structural MR image analysis and implementation as FSL. *Neuroimage*, *23*, S208-S219.

Sobel, M. E. 1982. Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*, *13*(1982), 290-312.

Sonenshein, S. 2007. The role of construction, intuition, and justification in responding to ethical issues at work: The sensemaking-intuition model. *Academy of Management Review*, *32*(4), 1022-1040.

Stanley, T. D., & Tran, U. 1998. Economics students need not be greedy: Fairness and the ultimatum game. *The Journal of Socio-Economics*, *27*(6), 657-663.

Steinel, W., & De Dreu, C. K. 2004. Social motives and strategic misrepresentation in social decision making. *Journal of Personality and Social Psychology*, *86*(3), 419.

Stuber, G. D., Sparta, D. R., Stamatakis, A. M., Van Leeuwen, W. A., Hardjoprajitno, J. E., Cho, S., ... & Bonci, A. 2011. Excitatory transmission from the amygdala to nucleus accumbens facilitates reward seeking. *Nature*, *475*(7356), 377-380.

Tabibnia, G., Satpute, A. B., & Lieberman, M. D. 2008. The sunny side of fairness preference for fairness activates reward circuitry (and disregarding unfairness activates self-control circuitry). *Psychological Science*, *19*(4), 339-347.

Takahashi, H., Yahata, N., Koeda, M., Matsuda, T., Asai, K., & Okubo, Y. 2004. Brain activation associated with evaluative processes of guilt and embarrassment: an fMRI study. *Neuroimage*, *23*(3), 967-974.

Tenbrunsel, A. E., & Smith-Crowe, K. 2008. 13 ethical decision making: Where we've been and where we're going. *The Academy of Management Annals*, *2*(1), 545-607.

Treviño, L. K. 1986. Ethical decision making in organizations: A person-situation interactionist model. *Academy of Management Review*, *11*(3), 601-617.

Treviño, L. K., Weaver, G. R., & Reynolds, S. J. (2006). Behavioral ethics in organizations: A review. *Journal of Management*, *32*(6), 951-990.

Wang, L., Malhotra, D., & Murnighan, J. K. 2011. Economics education and greed. *Academy of Management Learning & Education*, *10*(4), 643-660.

Wang, L., & Murnighan, J. K. 2011. On greed. *The Academy of Management Annals*, *5*(1), 279-316.

Wilke, H. A. 1991. Greed, efficiency and fairness in resource management situations. *European Review of Social Psychology*, *2*(1), 165-187.

Williams, R. H., & Zimmerman, D. W. 1996. Are simple gain scores obsolete? *Applied Psychological Measurement*, *20*(1), 59-69.

Wilson, D. S., Near, D., & Miller, R. R. 1996. Machiavellianism: a synthesis of the evolutionary and psychological literatures. *Psychological Bulletin*, *119*(2), 285.

Woolrich, M. W., Ripley, B. D., Brady, M., & Smith, S. M. 2001. Temporal autocorrelation in univariate linear modeling of FMRI data. *Neuroimage*, *14*(6), 1370-1386.

Wu, C. C., Sacchet, M. D., & Knutson, B. 2015. Toward an affective neuroscience account of financial risk taking. *Decision Making under Uncertainty*, 134.

Appendix I

Survey Measures

Dispositional Greed Scale (Seuntjens et al., 2015)
1. I always want more
2. Actually, I'm kind of greedy
3. One can never have too much money
4. As soon as I have acquired something, I start to think about the next thing I want
5. It doesn't matter how much I have. I'm never completely satisfied
6. My life motto is "more is better"
7. I can't imagine having too many things

Reward Responsiveness from the Behavioral Inhibition/Avoidance Scale (Carver & White, 1994)
1. When I get something I want I feel excited and energized
2. When I'm doing well at something, I love to keep at it
3. When good things happen to me, it affects me strongly
4. It would excite me to win a contest
5. When I see an opportunity for something I like, I get excited right away